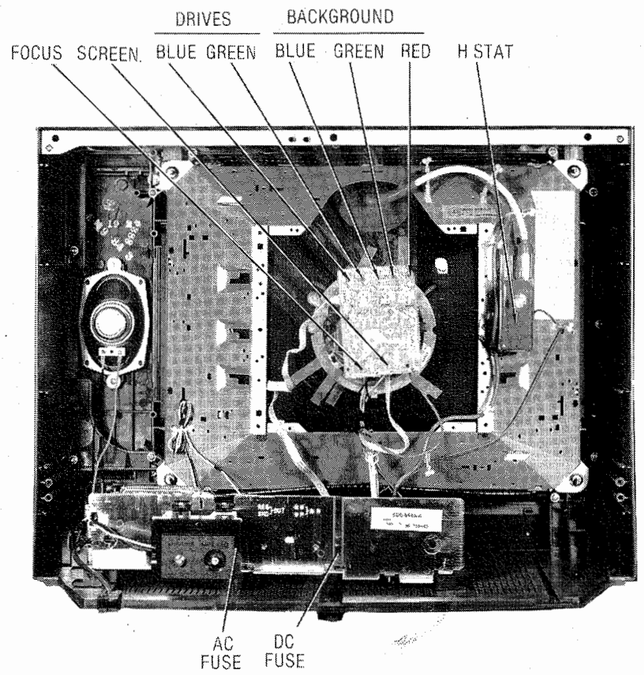



**CABINET–REAR VIEW**

## DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

Remove three screws holding cabinet back and remove back. Disconnect HV anode, CRT socket, deflection yoke connectors, degaussing coil connectors, speaker connectors and ground leads. Remove two screws and release two latches holding main board, tuner and remote control assemblies to cabinet bottom and slide board assembly out of cabinet.

CRT REMOVAL

Follow "Chassis Removal" procedure and lay set facedown on a soft protective surface. Loosen and remove CRT neck assemblies. Remove four nuts holding degaussing coil and CRT to cabinet front and lift CRT out of cabinet. Do not lift CRT by the neck.

## SERVICING IN THE FIELD

CRT IMPLOSION PROTECTION AND CLEANING

Implosion protection is an integral part of the picture tube, cleaning accomplished without CRT removal.

FUSE DEVICES

A 1.2-amp fuse is used for low-voltage power-supply protection. (See photo, Cabinet-Rear View.)

A 5-amp fuse is used for AC line protection. (See photo, Cabinet-Rear View.)

VHF/UHF TUNER

See Miscellaneous Adjustments.

HORIZONTAL OSCILLATOR

Adjustment of the horizontal hold is accomplished by the proper setting of the horizontal frequency. (See Placement Chart.)

FOCUS

The focus may be varied by a focus control. (See photo, Cabinet-Rear View.)

AGC

The AGC may be varied by an AGC control. (See Placement Chart.)

CENTERING

Horizontal centering is accomplished by proper placement of the horizontal centering jumper (L, C, R). (See Placement Chart.)

Vertical centering is accomplished by positioning of the vertical centering switch. (See Placement Chart.)

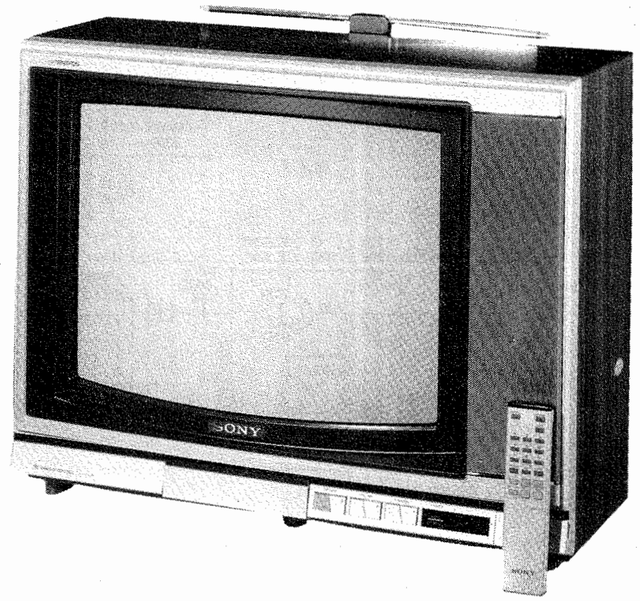




For Supplier Address See PHOTOFACT® Index

Models
KV-1970R,
KV-1971R,
KV-1992R,
KV-1993R

SONY CHASSIS
SCC-548A-A/B-A/G-A/H-A




Model KV-1970R

**SAFETY PRECAUTIONS**
See page 4.

**SERVICE INFORMATION**
See page 7.

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4300 West 62nd Street, P.O. Box 7092, Indianapolis, Indiana 46206 U.S.A.

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed.

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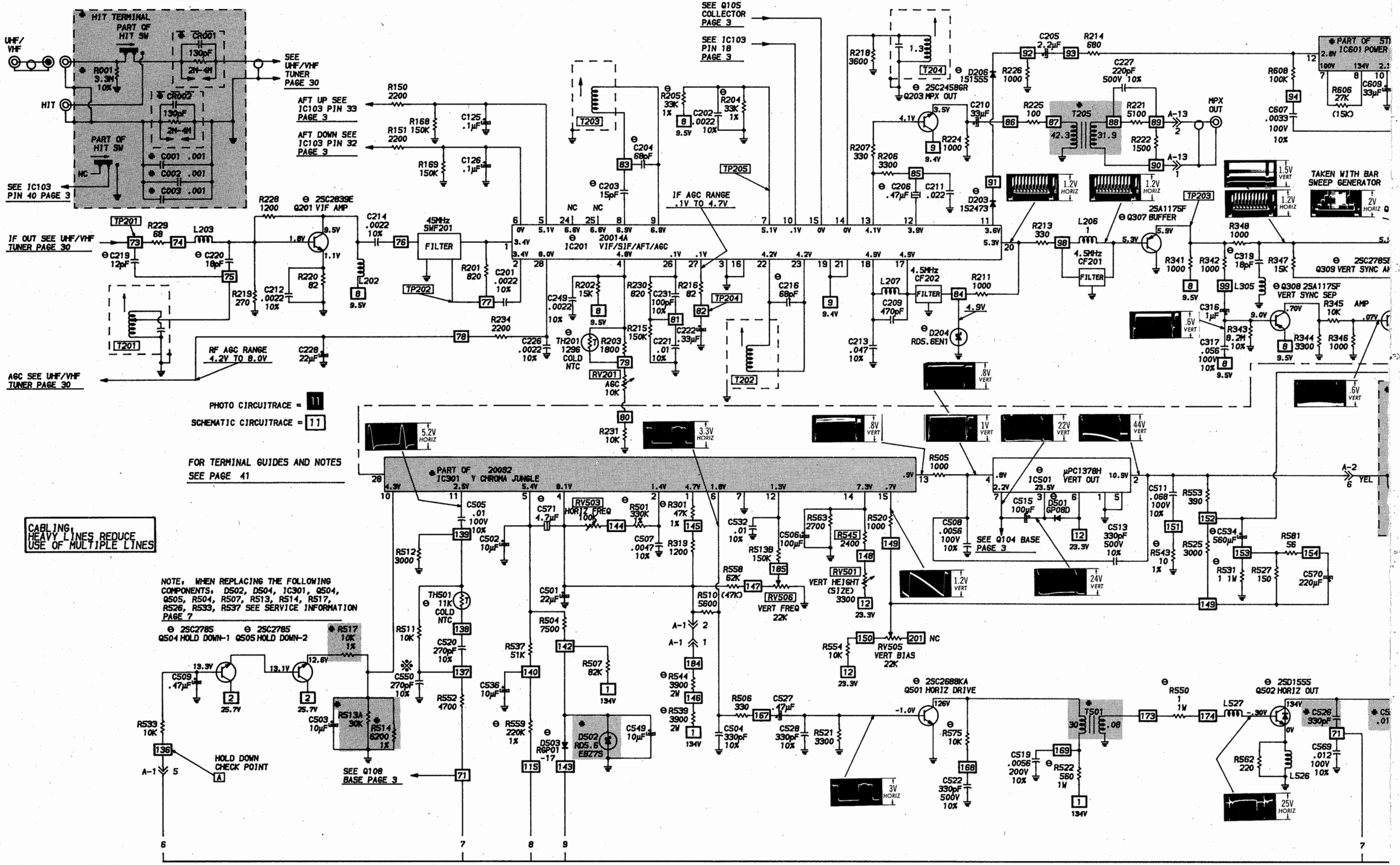
Printed in U.S. of America. 85PD01026

DATE 6-85 SET 2330 FOLDER 2

SET 2330 FOLDER 2


HIT TERMINAL
PART OF HIT SW
UHF/VHF
HIT
NC
SEE IC103 PIN 40 PAGE 3
SEE UHF/VHF TUNER PAGE 30
AFT UP SEE IC103 PIN 33 PAGE 3
AFT DOWN SEE IC103 PIN 32 PAGE 3
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IF OUT SEE UHF/VHF TUNER PAGE 30
AGC SEE UHF/VHF TUNER PAGE 30
RF AGC RANGE 4.2V TO 8.0V
IF AGC RANGE .1V TO 4.7V
2SC2839E Q201 VIF AMP
45MHz SWF201 FILTER
20014A IC201 VIF/SIF/AFT/AGC
TH201 1296 COLD NTC
RV201 AGC 10K
2SC2458GR Q203 MPX OUT
D206 1S1555
D203 1S2473
4.5MHz CF202 FILTER
4.5MHz CF201 FILTER
2SA1175SF Q307 BUFFER
TAKEN WITH BAR SWEEP GENERATOR
2SA1175SF Q309 VERT SYNC AMP
Q308 2SA1175SF VERT SYNC SEP
D204 RD5.6EN1
PART OF 20082 IC301 Y CHROMA JUNGLE
RV503 HORIZ FREQ 100K
RV501 VERT HEIGHT (SIZE) 3300
RV506 VERT FREQ 22K
RV505 VERT BIAS 22K
TH501 11K COLD NTC
D502 RD5.6 EBZ7S
D503 RGP01-17
2SC2785 Q504 HOLD DOWN-1
2SC2785 Q505 HOLD DOWN-2
HOLD DOWN CHECK POINT
SEE Q108 BASE PAGE 3
SEE Q104 BASE PAGE 3
2SC2688KA Q501 HORIZ DRIVE
2SD1555 Q502 HORIZ OUT
μPC1378H VERT OUT IC501
DS01 GP08D
T501
L526
PART OF STR IC601 POWER
MPX OUT
PHOTO CIRCUITRACE = 11
SCHEMATIC CIRCUITRACE = 11
FOR TERMINAL GUIDES AND NOTES SEE PAGE 41
CABLING: HEAVY LINES REDUCE USE OF MULTIPLE LINES
NOTE: WHEN REPLACING THE FOLLOWING COMPONENTS: DS02, DS04, IC301, QS04, Q505, R504, R507, R513, RS14, R517, R526, R533, R537 SEE SERVICE INFORMATION PAGE 7

A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE

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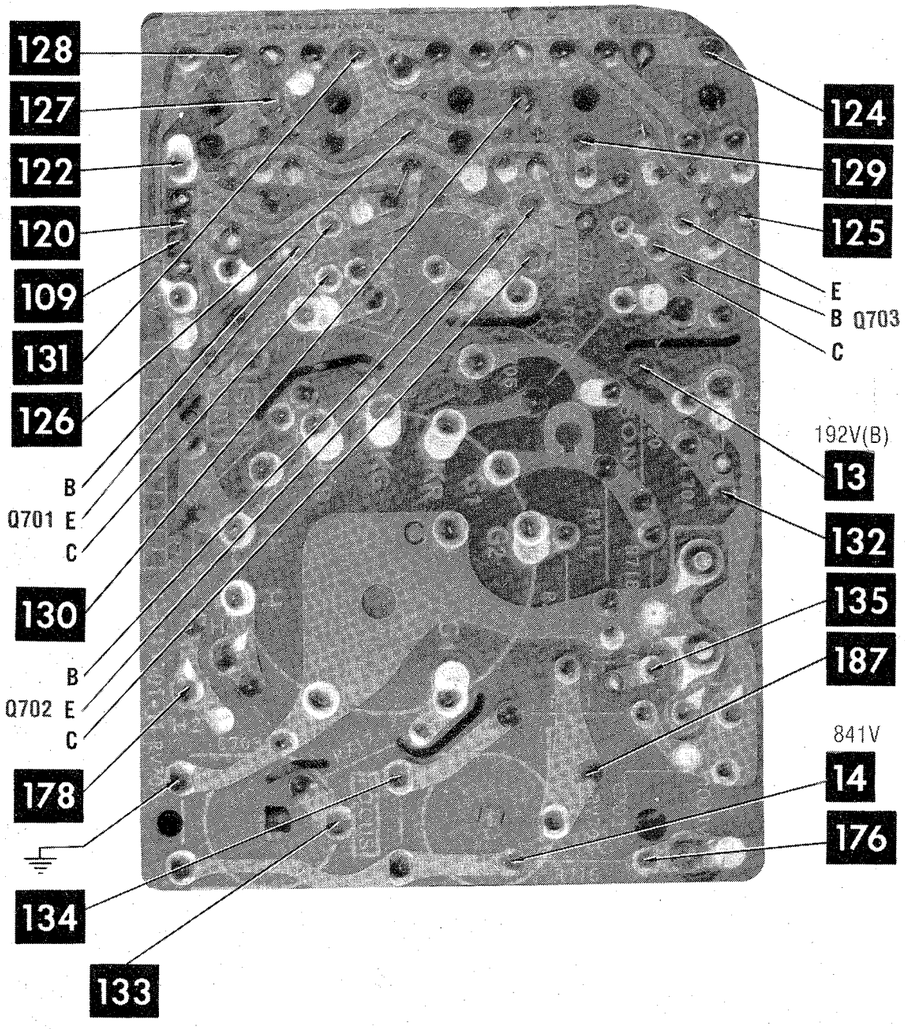


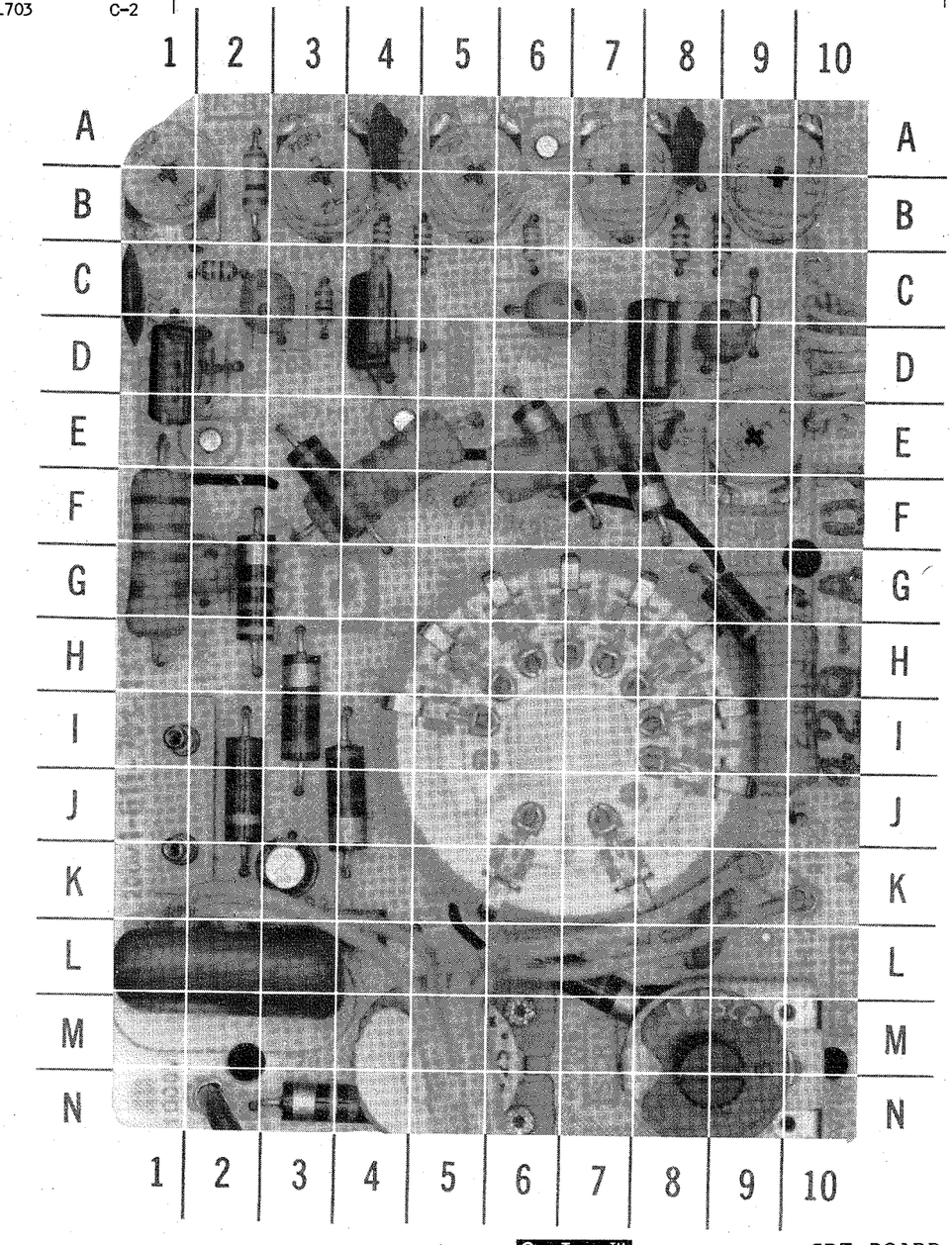

CRT BOARD

A Howard W. Sams CIRCUITRACE® Photo



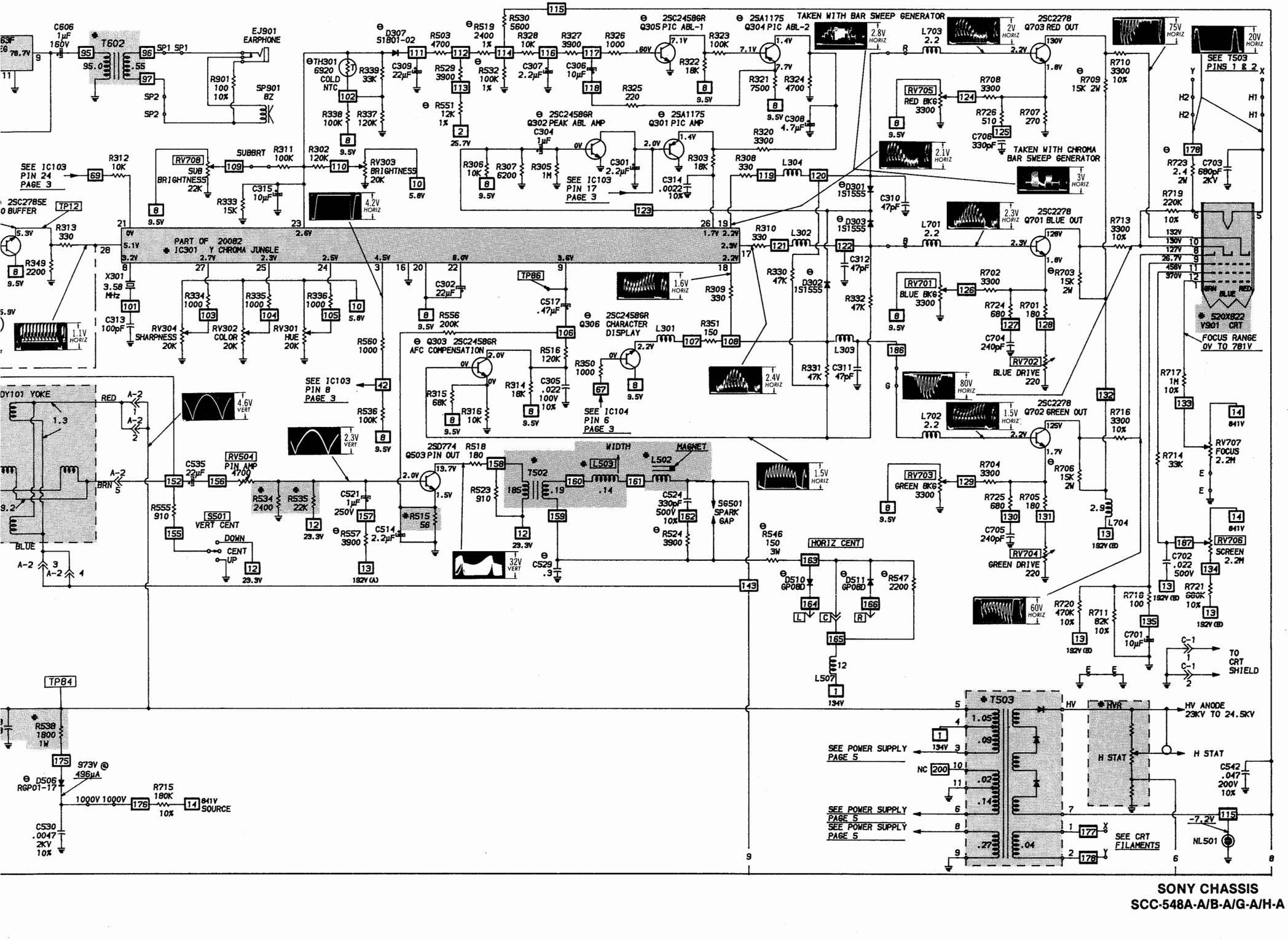
CRT BOARD-GridTrace LOCATION GUIDE

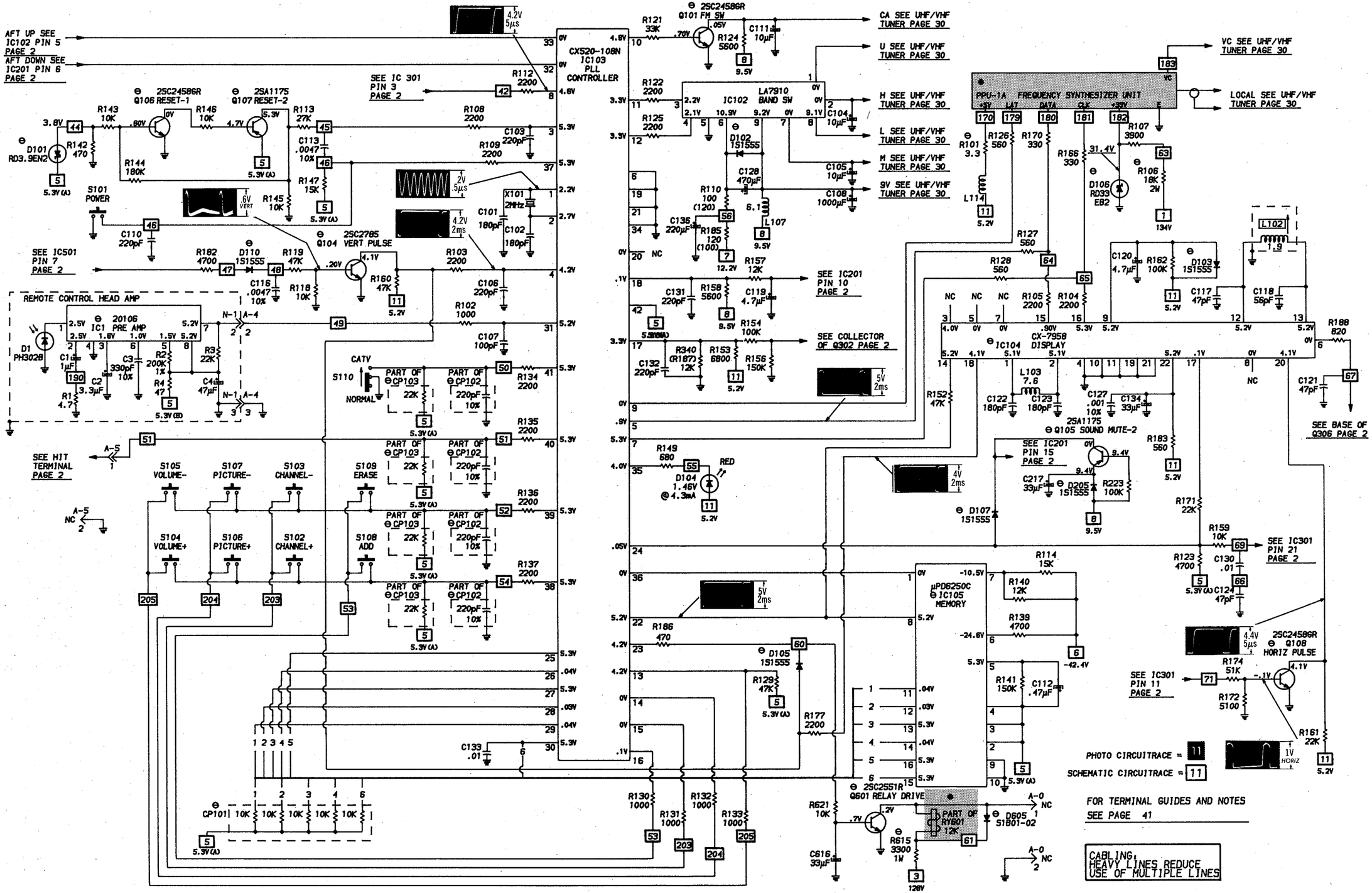
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| C-1 | J-1 | L704 | G-2 | R706 | F-4 | R716 | E-6 | R726 | D-1 |
| C701 | K-3 | Q701 | D-8 | R707 | C-2 | R717 | L-7 | RV701 | B-5 |
| C702 | L-2 | Q702 | D-4 | R708 | B-2 | R718 | J-2 | RV702 | B-9 |
| C703 | L-8 | Q703 | D-1 | R709 | F-1 | R719 | G-9 | RV703 | B-3 |
| C704 | A-8 | R701 | B-9 | R710 | E-3 | R720 | G-2 | RV704 | B-7 |
| C705 | A-4 | R702 | B-6 | R711 | I-3 | R721 | K-3 | RV705 | B-1 |
| C706 | C-1 | R703 | E-7 | R713 | F-8 | R723 | H-9 | RV706 | M-4 |
| L701 | D-9 | R704 | C-3 | R714 | J-4 | R724 | B-8 | RV707 | M-9 |
| L702 | C-6 | R705 | B-5 | R715 | N-3 | R725 | B-4 | RV708 | E-9 |
| L703 | C-2 | | | | | | | | |




A Howard W. Sams GRIDTRACE™ Photo

CRT BOARD


TAKEN WITH BAR SWEEP GENERATOR
TAKEN WITH CHROMA BAR SWEEP GENERATOR
PART OF 20082 * IC301 Y CHROMA JUNGLE
SEE IC103 PIN 24 PAGE 3
SEE IC103 PIN 17 PAGE 3
SEE IC103 PIN 8 PAGE 3
SEE IC104 PIN 6 PAGE 3
SEE POWER SUPPLY PAGE 5
SEE CRT FILAMENTS
TO CRT SHIELD
HV ANODE 23KV TO 24.5KV
H STAT
* 520X822 V901 CRT
FOCUS RANGE 0V TO 781V
SONY CHASSIS
SCC-548A-A/B-A/G-A/H-A


AFT UP SEE IC102 PIN 5 PAGE 2
AFT DOWN SEE IC201 PIN 6 PAGE 2
SEE IC 301 PIN 3 PAGE 2
CX520-108N IC103 PLL CONTROLLER
Q101 FM SW 2SC2458GR
IC102 LA7910 BAND SW
D102 1S1555
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VC SEE UHF/VHF TUNER PAGE 30
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SEE IC501 PIN 7 PAGE 2
Q104 2SC2785 VERT PULSE
Q106 RESET-1 2SC2458GR
Q107 RESET-2 2SA1175
S101 POWER
X101 2MHz
REMOTE CONTROL HEAD AMP
IC1 20106 PRE AMP
D1 PH302B
SEE IC201 PIN 10 PAGE 2
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CX-7958 DISPLAY
IC104
Q105 SOUND MUTE-2 2SA1175
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D107 1S1555
D205 1S1555
SEE BASE OF Q306 PAGE 2
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SEE IC301 PIN 11 PAGE 2
Q108 2SC2458GR HORIZ PULSE
μPD6250C IC105 MEMORY
Q601 RELAY DRIVE 2SC2551R
D605 S1B01-02
CP101
CP102
CP103
S110 CATV NORMAL
S105 VOLUME-
S107 PICTURE-
S103 CHANNEL-
S109 ERASE
S104 VOLUME+
S106 PICTURE+
S102 CHANNEL+
S108 ADD
SEE HIT TERMINAL PAGE 2
D104 1.46V @ 4.3mA RED
PHOTO CIRCUITRACE = 11
SCHEMATIC CIRCUITRACE = 11
FOR TERMINAL GUIDES AND NOTES SEE PAGE 41
CABLING: HEAVY LINES REDUCE USE OF MULTIPLE LINES

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## SAFETY PRECAUTIONS

After correcting the original service problem, perform the following safety checks before releasing the set to the customer:

1. Check the area of your repair for unsoldered or poorly-soldered connections. Check the entire board surface for solder splashes and bridges.
2. Check the interboard wiring to ensure that no wires are "pinched" or contact high-wattage resistors.
3. Check that all control knobs, shields, covers, ground straps, and mounting hardware have been replaced. Be absolutely certain that you have replaced all the insulators.
4. Look for unauthorized replacement parts, particularly transistors, that were installed during a previous repair. Point them out to the customer and recommend their replacement.
5. Look for parts which, though functioning, show obvious signs of deterioration. Point them out to the customer and recommend their replacement.
6. Check the line cord for cracks and abrasion. Recommend the replacement of any such line cord to the customer.
7. Check the condition of the monopole antenna (if any).
   Make sure the end is not broken off, and has the plastic cap on it. Point out the danger of impalement on a broken antenna to the customer, and recommend the antenna's replacement.
8. Check the B+ and HV to see they are at the values specified. Make sure your instruments are accurate; be suspicious of your HV meter if sets always have low HV.
9. Check the antenna terminals, metal trim, "metallized" knobs, screws, and all other exposed metal parts for AC leakage. Check leakage as described below.

### LEAKAGE TEST

The AC leakage from any exposed metal part to earth ground and from all exposed metal parts to any exposed metal part having a return to chassis, must not exceed 0.5 mA (500 microampers). Leakage current can be measured by any one of three methods.

1. A commercial leakage tester, such as the Simpson 229 or RCA WT-540A. Follow the manufacturers' instructions to use these instruments.
2. A battery-operated AC milliammeter. The Data Precision 245 digital multimeter is suitable for this job.
3. Measuring the voltage drop across a resistor by means of a VOM or battery-operated AC voltmeter. The "limit" indication is 0.75 V, so analog meters must have an accurate low-voltage scale. The Simpson 250 and Sanwa SH-63Trd are examples of a passive VOM that is suitable. Nearly all battery operated digital multimeters that have a 2V AC range are suitable. (See Fig. A)

### HOW TO FIND A GOOD EARTH GROUND

A cold-water pipe is guaranteed earth ground; the cover-plate retaining screw on most AC outlet boxes is also at earth ground. If the retaining screw is to be used as your earth-ground, verify that it is at ground by measuring the resistance between it and a cold-water pipe with an ohmmeter. The reading should be zero ohms. If a cold-water pipe is not accessible, connect a 60–100 watts trouble light (not a neon lamp) between the hot side of the receptacle and the retaining screw. Try both slots, if necessary, to locate the hot side of the line, the lamp should light at normal brilliance if the screw is at ground potential. (See Fig. B)

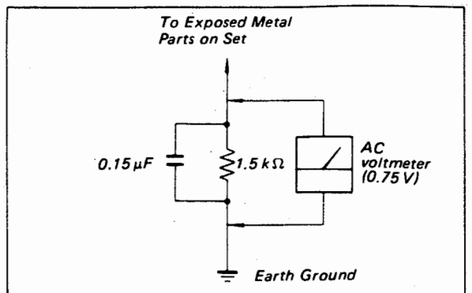



Fig. A. Using an AC voltmeter to check AC leakage.

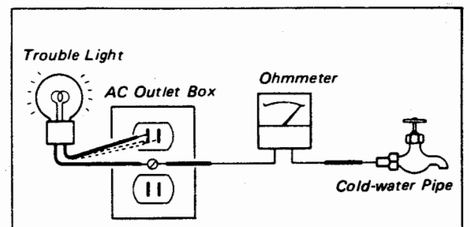
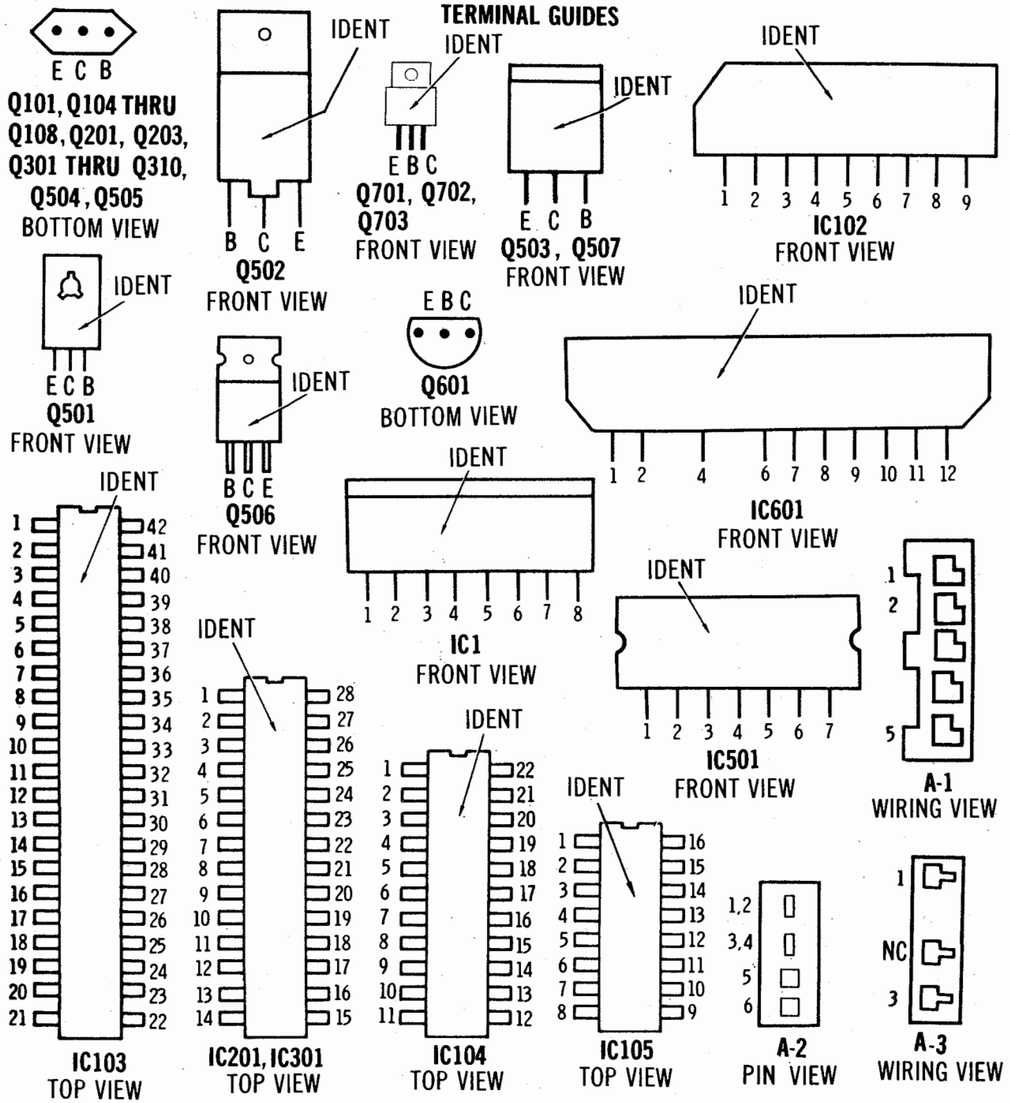
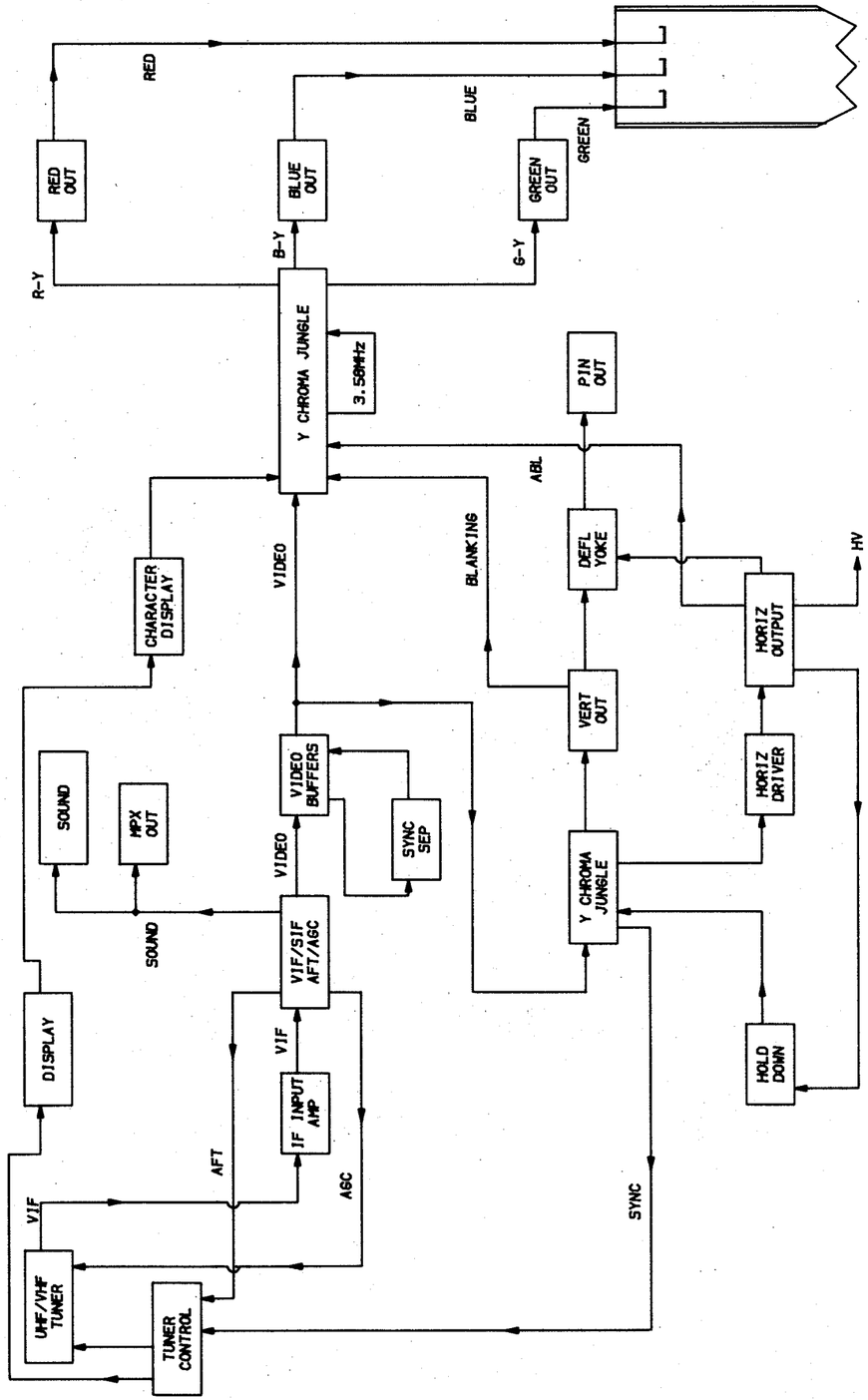



Fig. B. Checking for earth ground.

Courtesy of the Manufacturer

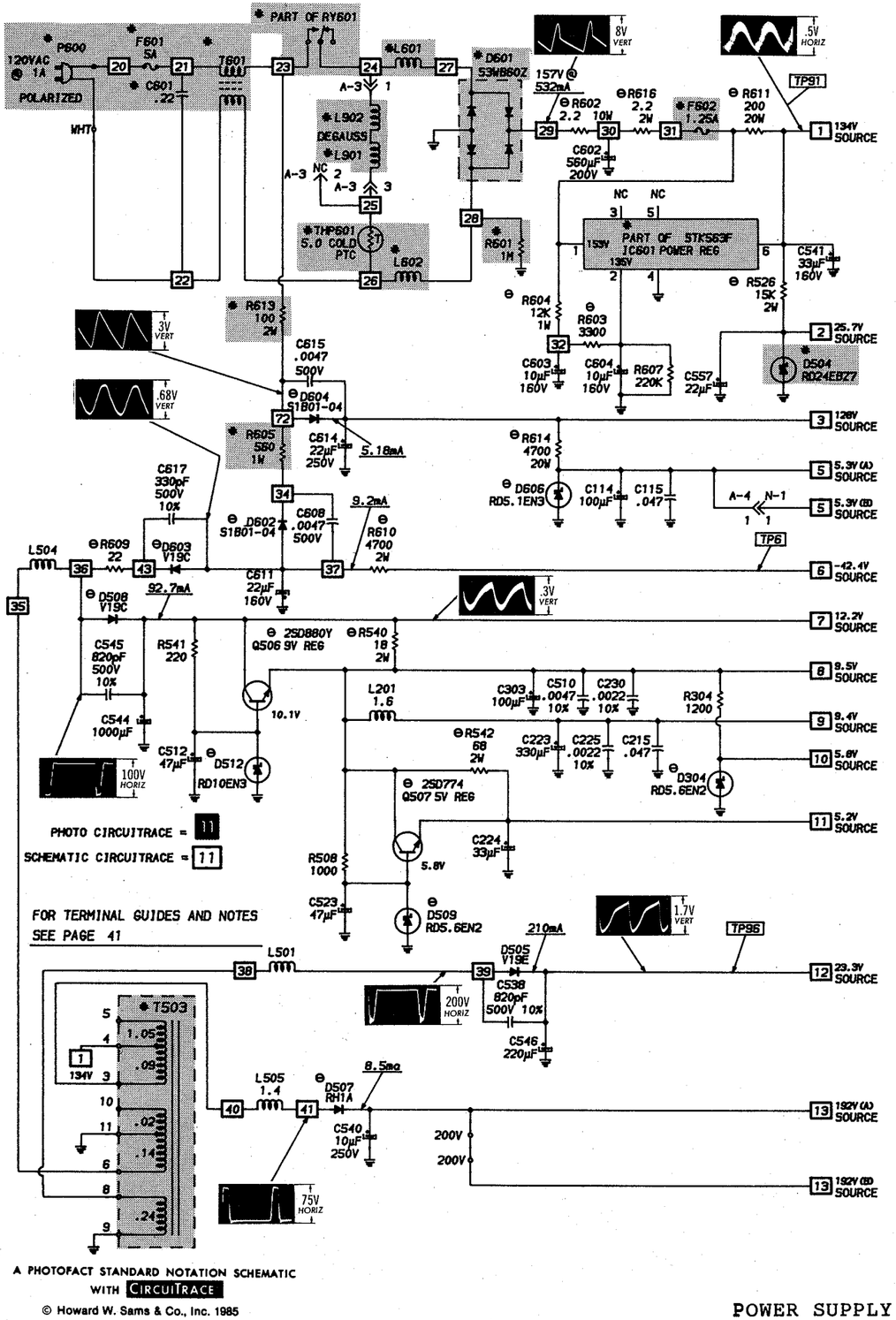







BLOCK DIAGRAM



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POWER SUPPLY

## TV ALIGNMENT INSTRUCTIONS

Use an isolation transformer, or observe polarity, and maintain line voltage at 120VAC.
Allow a 20-minute warm-up period for receiver and test equipment.
Suggested Alignment Tools: GC ELECTRONICS

L102, T201, T202, T203, T204.....9440

**PRELIMINARY INSTRUCTIONS**

Set the channel selector to the highest unused channel. Set scope sweep to external. Connect scope vertical input to scope vertical input on sweep/marker generator. Connect scope external horizontal input to scope horizontal input on sweep/marker generator. Ground test equipment to TV chassis unless specified otherwise. Use only enough generator output to provide a usable indication.
Note: Response may vary slightly from that shown.

Connect 4.0V to 4.5V Bias to TP204 (Junction R216 and C222).

**VIDEO IF ALIGNMENT (SWEEP MARKER GENERATOR)**

| DIRECT PROBE FROM SWEEP/MARKER GENERATOR | SWEEP GENERATOR OUTPUT | SWEEP GENERATOR FREQUENCY | MARKER GENERATOR FREQUENCY | REMARKS |
|---|---|---|---|---|
| To TP203 | To TP201 (Junction R229 and C219) | 44MHz (10MHz Sweep) | 47.25MHz Modulated | Adjust T201 for MINIMUM. See Figure 1. |
| " | To TP202 (Junction R201 and C201) | " | 45.75MHz | Adjust T202 to place 45.75MHz at peak (Maximum). See Figure 2. |

**VIDEO IF ALIGNMENT (BAR SWEEP GENERATOR)**

| BAR SWEEP GENERATOR | SCOPE INPUT | REMARKS |
|---|---|---|
| To TP201 (Junction R229 and C219) | To TP203 | Perform Video IF Adjustments per SWEEP/MARKER GENERATOR instructions above. See Figure 3. |

**SOUND IF ALIGNMENT**

Tune in a station and adjust T204 for maximum sound. Reduce signal strength at the antenna terminals until distortion appears. Continue to reduce the signal while aligning for undistorted output by adjusting T204.

Figure 1

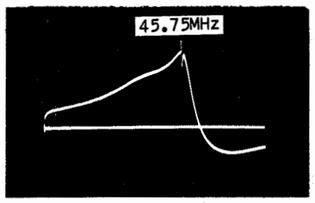



Figure 2

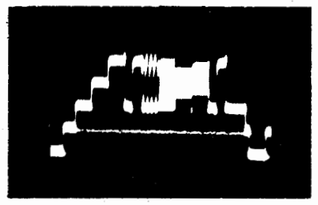


Figure 3

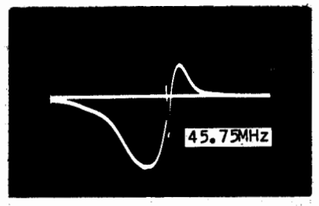



Figure 4

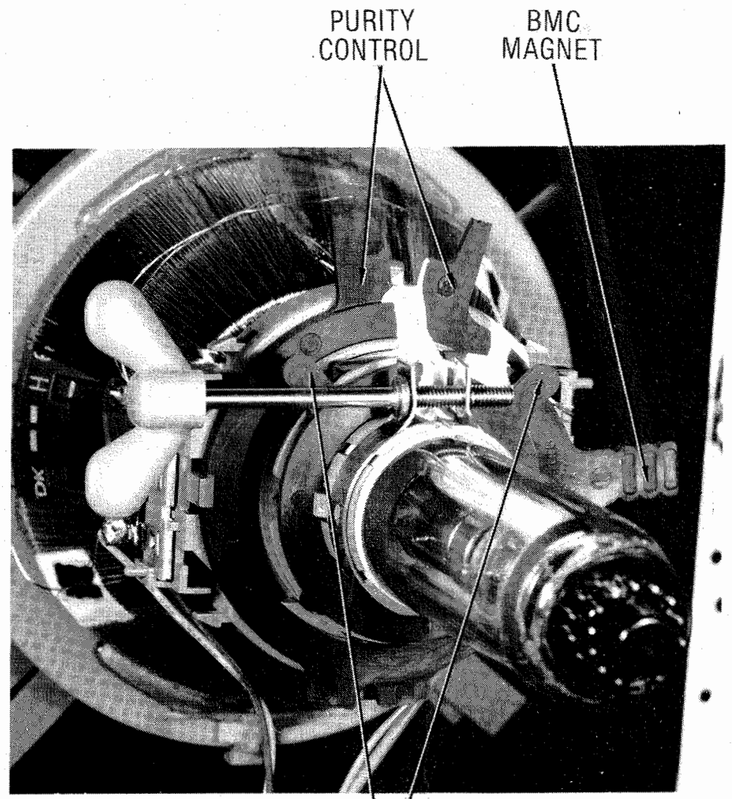


## MISCELLANEOUS ADJUSTMENTS

assembly between the picture tube and the deflection yoke behind the areas affected on the screen. Position the permalloy assemblies for the best horizontal and vertical convergence correction in the corners affected. Repeat appropriate convergence procedure if necessary to obtain the best overall convergence.

COLOR TEMPERATURE ADJUSTMENT

Connect a crosshatch generator to the antenna terminals and tune in a crosshatch pattern. Set the Brightness and Picture Controls to MINIMUM. Turn G (Green RV704) and B (Blue RV702) Drive Controls to Maximum. Turn B (Blue RV701), G (Green RV703) and R (Red RV705) Background (BKG) Controls to midrange. Turn G2 Adjust Control (RV706) to obtain a faintly visible crosshatch pattern. Adjust Background (BKG) Controls for best white balance on the faintly visible pattern. Turn the Brightness and Picture Controls to Maximum. Adjust the Drive Controls for best white balance on the pattern. Check tracking at high and low brightness levels and repeat procedure if necessary.



## MISCELLANEOUS ADJUSTMENTS

PRETUNING ADJUSTMENT

1. Connect antenna.
2. Depress power button.
3. Open control acess door.
4. Fourteen buttons are provided channel selection, channel up and down on remote hand unit and likewise on televsion face. Remote hand unit also provides ten buttons for direct channel access.
5. Depress proper buttons for channel to be pretuned. (Use buttons 0-9 on remote hand unit).
6. Depress Add to add desired channel to memory.
7. Repeat steps 5 and 6 for every channel to be programmed into memory.
8. To erase channel from memory, Depress proper buttons for channel to be deleted from memory.
9. Depress Erase to delete channel from memory.
10. Repeat steps 8 and 9 for every channel to be deleted from memory.
11. Close control door.

HORIZONTAL FREQUENCY ADJUSTMENT

Tune in a TV station. Connect a digital meter to (TP86 Horizontal Frequency) pin 9 - IC301, low side to ground. Adjust Horizontal Frequency Control (RV503) for 3.2 ±0.1V DC.

VERTICAL FREQUENCY ADJUSTMENT

Set tuner to an unused channel. Connect a frequency counter from pin 2 of Connector A-2, low side to ground. Adjust Vertical Frequency Control (RV506) for 55Hz ±0.3Hz reading on the counter.

VERTICAL SIZE ADJUSTMENT

Tune in a TV station. Set Vertical Size Control (RV501) to MINIMUM. Select one of the following values 1000, 1800, 2400, 3900 ohms (1/4W carbon) resistor for R545 to produce a rater 5% to 20% reduced from a full vertical raster. Adjust Vertical Size Control (RV501) for a full size vertical raster.

VERTICAL BIAS ADJUSTMENT

Tune in a TV station. Connect a digital meter from pin 2, Connector A-2, low side to ground. Adjust Vertical Bias Control (RV505) for 12.5 ±0.5V DC. Check Vertical Size Control setting.

HORIZONTAL SIZE ADJUSTMENT

Tune in a picture and adjust Horizontal Size Control (L503) for proper horizontal size.

HORIZONTAL CENTERING ADJUSTMENT

Move Connector (Horizontal Centering) to one of the terminals (L, C or R) which ever gives the best horizontal centering.

VERTICAL CENTERING ADJUSTMENT

Move Vertical Centering Switch (S501) to one of three positions (Up, C or Dn), whichever gives the best vertical centering.

VHF-RF-AGC ADJUSTMENT

Tune in a medium strength VHF TV station. Turn AGC Control (RV201) until snow appears and then back off until snow just disappears.

INDICATOR POSITION ADJUSTMENT

Tune in a picture. Set the Brightness Control to midrange. Press and hold the Picture Control. Adjust L102 until the maximum indicating bar is approximately 3/4 inch from right side of screen.

SUB BRIGHTNESS CONTROL ADJUSTMENT

Tune in a picture. To prevent blooming at maximum setting of Brightness and Picture Controls. Adjust Sub Brightness Control (RV708) for sufficient brightness at midrange.

PINAMP ADJUSTMENT

Connect a pattern generator to the antenna terminals and tune in a crosshatch pattern. Adjust Pinamp Control (RV504) to produce straight vertical lines on the screen.

PURITY ADJUSTMENT

If the picture tube appears to be magnetized, use a degaussing coil to demagnetize picture tube and mounting brackets. Loosen deflection yoke and slide it back as far as possible. Set Red (Background) (BKG) Control (RV705) to Maximum and Blue (RV701) and Green (RV703) Background (BKG) Controls to MINIMUM. Adjust purity rings on rear of deflection yoke to center the vertical red band. Slide the deflection yoke forward until a uniform red screen is obtained. If necessary, use disc magnets to correct impurity at the corners of the screen. (See Parts List.) Place disc magnets at rear corners of the picture tube.

CONVERGENCE ADJUSTMENT

Connect crosshatch generator to the antenna terminals and tune in a dot pattern. Adjust the Horizontal Static Control to converge the red and blue dots horizontally over the green dot at the center of the screen. Rotate the Vertical Static Magnets to converge the red and blue dots vertically over the green dot at the center of the screen. NOTE: Rotate the two Vertical Static Magnets equally, one to the right and one to the left from vertical position. NOTE: Some versions may use a BMC Magnet. To adjust the BMC Magnet slide it in in and out to correct for insufficient horizontal static convergence. Rotate the BMC Magnet to correct for insufficient vertical static convergence. Tune in a crosshatch pattern. If necessary remove the rubber wedges between the deflection yoke and picture tube. Tilt the deflection yoke up or down to converge the vertical lines at the top and bottom of the screen and the horizontal lines at the right and left sides of the screen. Tilt the deflection yoke to the right or left to converge the horizontal lines at the top and bottom of the screen and the vertical lines at the right and left sides of the screen. Replace the rubber wedges. To correct the convergence at the corners of the screen, slide a permalloy magnet



## TV ALIGNMENT INSTRUCTIONS (Continued)

AUTOMATIC FINE TUNING ALIGNMENT

| Connect as explained in preliminary instructions unless otherwise specified. | | | | |
|---|---|---|---|---|
| DIRECT PROBE FROM SWEEP/MARKER GENERATOR | SWEEP GENERATOR OUTPUT | SWEEP GENERATOR FREQUENCY | MARKER GENERATOR FREQUENCY | REMARKS |
| To TP205 (Junction R205 and Pin 7 - IC201) | To TP201 (Junction R229 and C219) | 44MHz (10MHz Sweep) | 45.75MHz | Adjust T203 to place 45.75MHz marker at crossover. See Figure 4. |

## SERVICE INFORMATION

### SAFETY RELATED ADJUSTMENT

*◪ R513 ADJUSTMENT*

*When replacing the following components (marked with ◪ on the schematic diagram), perform the adjustment as follows.*

*D502, D504, IC301, Q504, Q505, R504, R507, R513, R514, R517, R526, R533, R537*

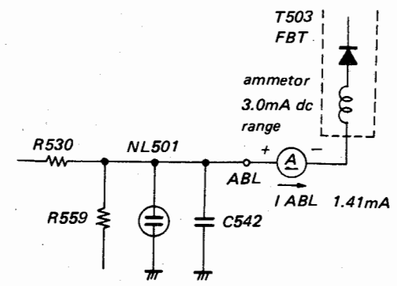
**Note:** The connection Point for R533 and connector A-1 is the hold down check point Ⓐ.

*(1) Before Adjustment*

1. *Supply 120V ac and the POWER switch set to ON.*
2. *Confirm that there is more than 12.15V at the hold down check point Ⓐ.*
3. *The POWER switch turns OFF.*

*(2) Readjustment Procedure*

1. *Disengage ABL terminal of FBT from the foil and connect the ammeter as shown to measure the ABL terminal current.*




2. *Supply 120V ac and the POWER switch sets to ON.*
3. *Apply 135V to TP91 from and external DC power supply.*
4. *Receive a stable signal such as an all-white signal and adjust ABL current to 1.41 mA with PICTURE, BRIGHT, etc. VRs.*
5. *Confirm that the HV HOLD DOWN CIRCUIT operates and that raster disappears when $17.07^{+0.00}_{-0.10}$ V is applied to hold down check point Ⓐ from an external DC power supply.*

   **Note:** When raster disappears, cut input voltage and applied voltage immediately.
6. *Confirm that the HV HOLD DOWN CIRCUIT does not operate when $16.06^{+0.10}_{-0.00}$ V is applied to hold down check point Ⓐ from an external DC power supply.*

   **Note:** If the HV HOLD DOWN CIRCUIT operates, immediately cut input and applied voltage.
7. *Receive a stable signal such as a dot signal and adjust ABL current for 85 µA with PICTURE and BRIGHT VRs.*
8. *Confirm that the HV HOLD DOWN CIRCUIT does not operate when $17.48^{+0.10}_{-0.00}$ V is applied to hold down check point Ⓐ from an external DC power supply.*

   **Note:** If the HV HOLD DOWN CIRCUIT operates, immediately cut input and applied voltage.
9. *Confirm that the HV HOLD DOWN CIRCUIT operates and raster disappears when $18.49^{+0.00}_{-0.10}$ V is applied to hold down check point Ⓐ from an external DC power supply.*

   **Note:** When raster disappears, cut input voltage and applied voltage immediately.
10. *Adjust R513 so that steps 5, 6, 8 and 9 are satisfied.*
11. *The POWER switch turns OFF.*
12. *Remove external DC power supply and DC ammeter.*
13. *Solder FBT ABL pin.*

*CHECKING AFTER H.V.R. REPLACEMENT*

*After replacing H.V.R., *comfirm that there is more than 12.15V on HOLD DOWN check point Ⓐ.*

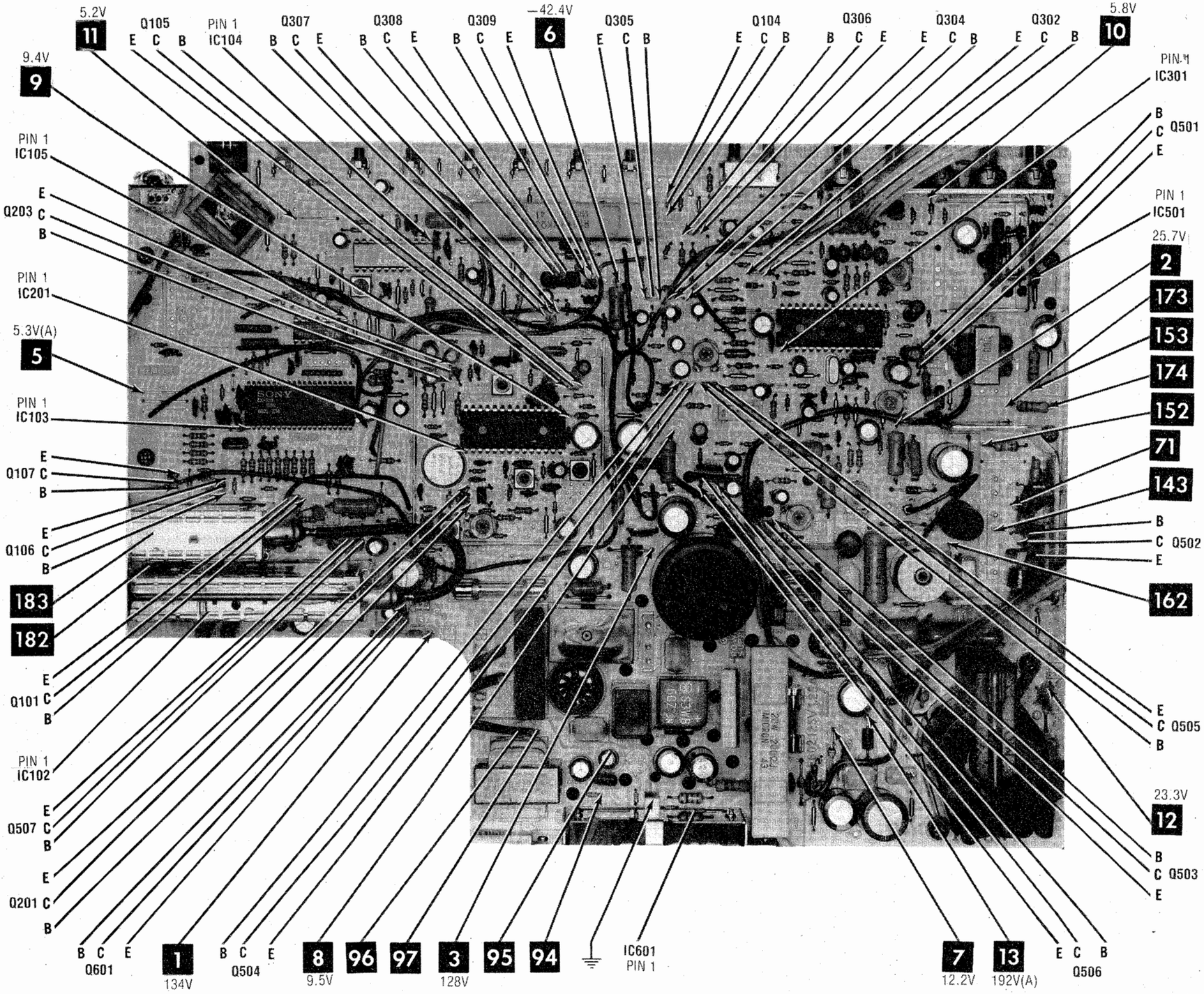
** This check is to be performed when H.V.R. only is replaced, and has no relation to the HV hold down circuit readjustment for replacement of parts marked ◪.*

**Note:** The connection Point for R533 and connector A-1 is the hold down check point Ⓐ.

*MAXIMUM +B VOLTAGE CONFIRMATION*

1. *Supply 130V ac to with variable auto-transformer.*
2. *Tune in an off air signal.*
3. *Set the PICTURE control to initial setting and BRIGHT control to mechanical center.*
4. *Confirm the voltage on digital multimeter is less than 137.3V dc.*
5. *If step 4 is not satisfied, replace IC601 on A board and repeat above steps.*

**Courtesy of the Manufacturer**

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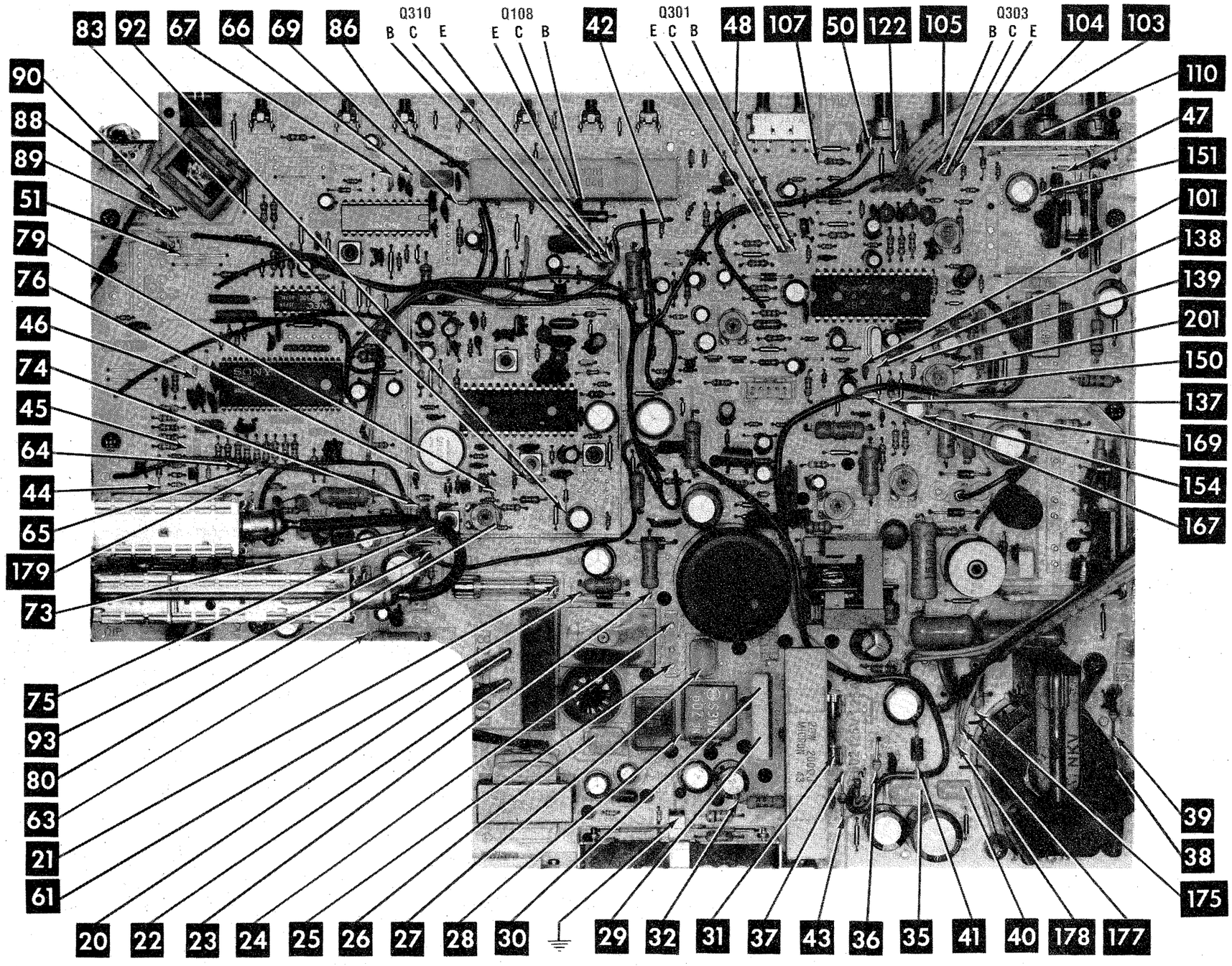




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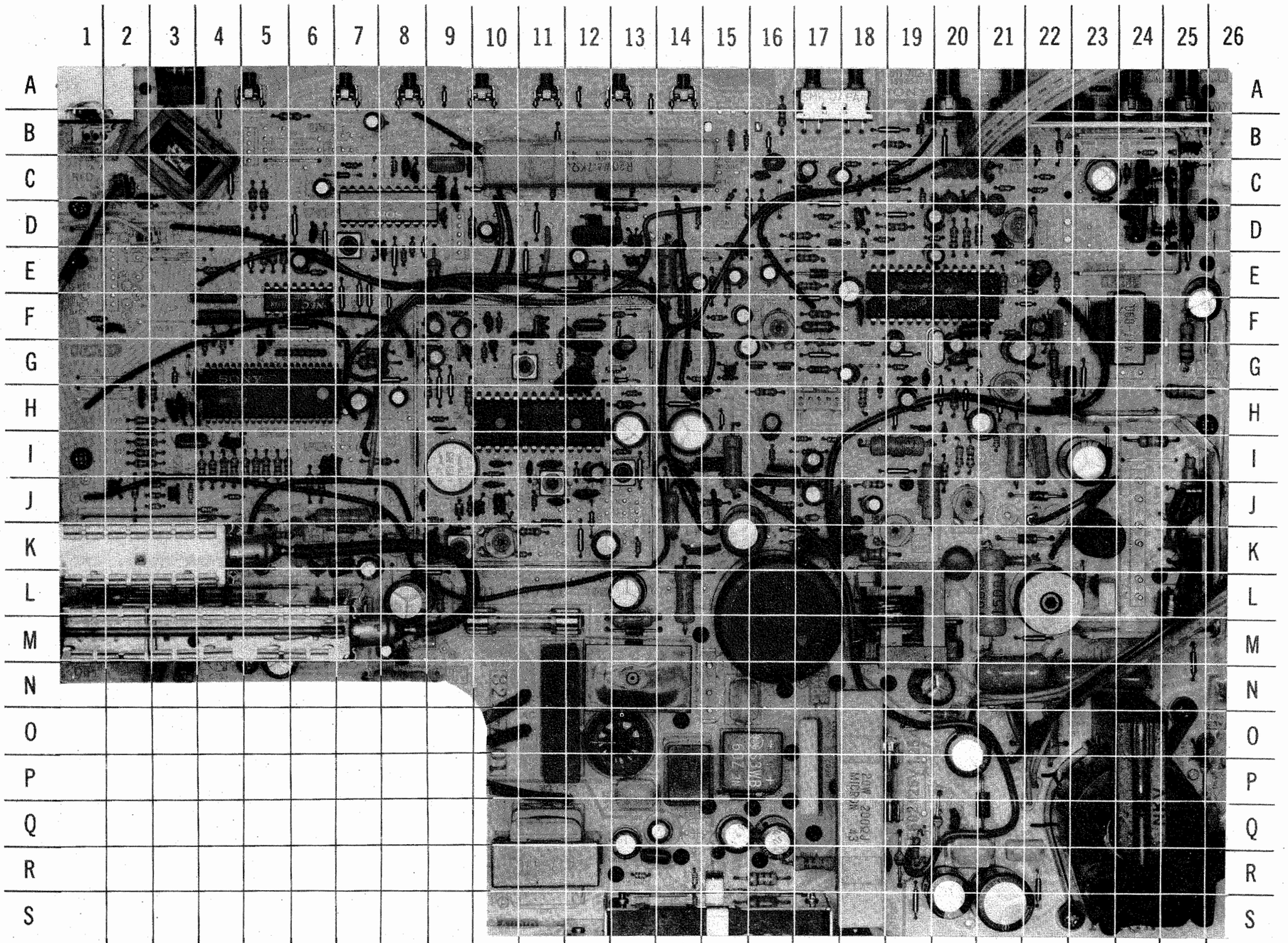
SET 2330 FOLDER 2

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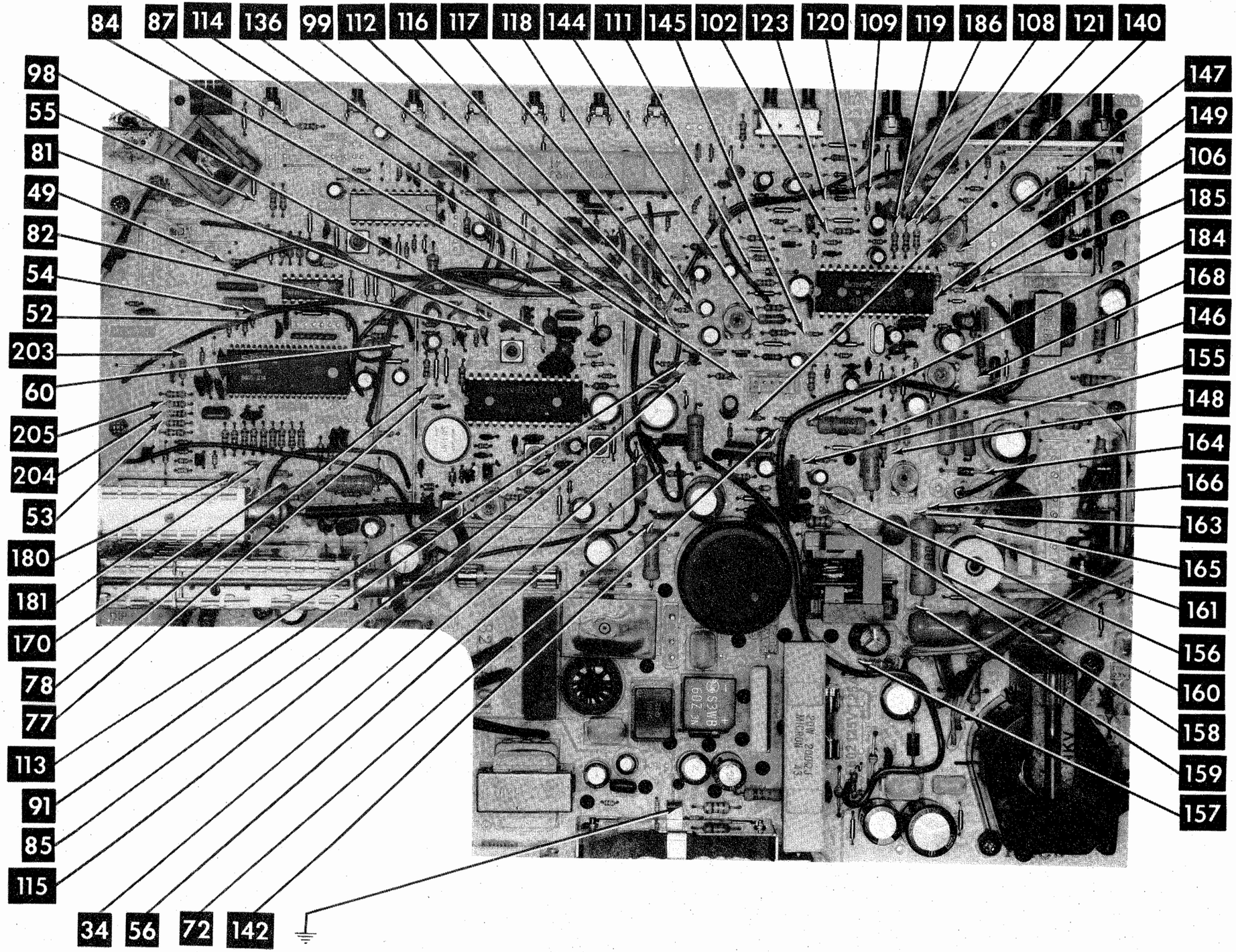
## MAIN BOARD-GridTrace LOCATION GUIDE

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A-0 | M-8 | C307 | E-14 | CP103 | F-4 | L601 | N-15 | R153 | J-6 | R330 | C-21 | R557 | O-20 |
| A-1 | H-17 | C308 | E-15 | D101 | J-2 | L602 | P-13 | R154 | D-17 | R331 | B-21 | R558 | E-22 |
| A-2 | K-24 | C309 | E-16 | D102 | M-6 | NL501 | R-26 | R156 | C-17 | R332 | C-21 | R559 | I-16 |
| A-3 | N-15 | C310 | C-20 | D103 | C-7 | Q101 | J-5 | R157 | I-8 | R333 | D-20 | R560 | F-17 |
| A-4 | B-1 | C311 | D-20 | D104 | A-3 | Q104 | B-15 | R158 | J-6 | R334 | A-23 | R562 | L-25 |
| A-5 | D-2 | C312 | B-20 | D105 | J-7 | Q105 | G-13 | R159 | D-9 | R335 | A-22 | R563 | F-21 |
| A-13 | C-2 | C313 | G-19 | D106 | L-1 | Q106 | J-3 | R160 | B-11 | R336 | A-20 | R575 | G-22 |
| C101 | H-3 | C314 | E-18 | D107 | E-11 | Q107 | J-2 | R161 | C-11 | R337 | D-18 | R581 | I-21 |
| C102 | H-3 | C315 | D-20 | D110 | C-25 | Q108 | C-12 | R162 | C-7 | R338 | D-18 | R601 | P-15 |
| C103 | H-3 | C316 | E-12 | D203 | I-12 | Q201 | J-10 | R166 | J-4 | R339 | D-19 | R602 | P-17 |
| C104 | N-3 | C317 | D-12 | D204 | F-13 | Q203 | G-9 | R168 | G-9 | R340 | C-15 | R603 | R-16 |
| C105 | N-3 | C319* | D-12 | D205 | G-13 | Q301 | D-17 | R169 | F-9 | R341 | E-13 | R604 | R-17 |
| C106 | I-4 | C501 | G-18 | D206 | J-12 | Q302 | D-17 | R170 | J-4 | R342 | E-12 | R605 | J-14 |
| C107 | G-5 | C502 | H-19 | D301 | C-19 | Q303 | B-21 | R171 | E-8 | R343 | D-13 | R606 | R-14 |
| C108 | L-8 | C503 | G-20 | D302 | C-19 | Q304 | E-15 | R172 | C-12 | R344 | D-12 | R607 | R-15 |
| C110 | F-2 | C504 | G-19 | D303 | C-19 | Q305 | E-15 | R174 | J-17 | R345 | D-13 | R608 | R-13 |
| C111 | K-5 | C505 | F-20 | D304 | B-22 | Q306 | C-16 | R177 | E-8 | R346 | C-13 | R609 | R-19 |
| C112 | E-6 | C506 | G-21 | D307 | E-17 | Q307 | E-12 | R182 | B-24 | R347 | D-13 | R610 | E-14 |
| C113 | H-2 | C507 | F-18 | D501 | C-24 | Q308 | D-12 | R183 | E-9 | R348 | E-13 | R611 | P-18 |
| C114 | H-7 | C508 | C-24 | D502 | I-17 | Q309 | D-13 | R186 | G-7 | R349 | E-13 | R613 | L-14 |
| C115 | G-4 | C509 | G-15 | D503 | I-23 | Q310 | E-13 | R188 | C-8 | R350 | B-9 | R614 | C-13 |
| C116 | B-25 | C510 | D-21 | D504 | I-19 | Q501 | F-22 | R199 | J-15 | R351 | B-19 | R615 | M-13 |
| C117 | D-6 | C511 | D-24 | D505 | P-25 | Q502 | K-25 | R201 | H-9 | R501 | F-17 | R616 | P-18 |
| C118 | E-7 | C512 | J-17 | D506 | O-22 | Q503 | K-18 | R202 | K-11 | R503 | F-15 | R621 | M-8 |
| C119 | H-8 | C513 | D-24 | D507 | Q-21 | Q504 | G-16 | R203 | J-10 | R504 | I-17 | RV201 | K-10 |
| C120 | C-6 | C514 | K-17 | D508 | Q-20 | Q505 | G-16 | R204 | J-11 | R505 | C-23 | RV301 | A-21 |
| C121 | C-8 | C515 | C-23 | D509 | K-8 | Q506 | I-16 | R205 | J-11 | R506 | H-19 | RV302 | A-23 |
| C122 | C-9 | C517 | E-22 | D510 | J-22 | Q507 | K-7 | R206 | I-12 | R507 | J-19 | RV303 | A-24 |
| C123 | C-9 | C519 | G-22 | D511 | K-22 | Q601 | M-8 | R207 | H-9 | R508 | K-7 | RV304 | A-25 |
| C124 | C-8 | C520 | H-20 | D512 | J-17 | R101 | K-5 | R211 | G-12 | R510 | G-19 | RV501 | J-20 |
| C125 | G-9 | C521 | N-20 | D601 | P-15 | R102 | E-4 | R213 | G-11 | R511 | H-20 | RV503 | F-16 |
| C126 | F-9 | C522 | H-22 | D602 | I-15 | R103 | I-4 | R214 | L-9 | R512 | G-21 | RV504 | K-19 |
| C127 | D-9 | C523 | K-7 | D603 | R-19 | R104 | C-5 | R215 | F-10 | R513A | H-18 | RV505 | G-21 |
| C128 | N-5 | C524 | L-23 | D604 | L-14 | R105 | C-5 | R216 | G-10 | R513B | E-22 | RV506 | D-21 |
| C130 | C-9 | C526 | K-25 | D605 | M-13 | R106 | N-8 | R218 | I-13 | R514 | H-18 | RY601 | N-13 |
| C131 | I-6 | C527 | F-22 | D606 | E-9 | R107 | L-1 | R219 | J-10 | R515 | L-18 | S101 | A-5 |
| C132 | I-6 | C528 | G-22 | F601 | M-11 | R108 | I-4 | R220 | I-10 | R516 | D-22 | S102 | A-7 |
| C133 | F-5 | C529 | N-21 | F602 | P-19 | R109 | G-3 | R221 | D-2 | R517 | G-17 | S103 | A-8 |
| C134 | D-10 | C530 | O-21 | HOLD DOWN CHECK | | R110 | M-6 | R222 | C-2 | R518 | K-18 | S104 | A-10 |
| C136 | L-13 | C532 | G-20 | POINT A | H-17 | R112 | I-5 | R223 | H-13 | R519 | G-14 | S105 | A-11 |
| C201 | H-9 | C534 | I-23 | H CENT | | R113 | I-2 | R224 | F-9 | R520 | E-21 | S106 | A-13 |
| C202 | I-11 | C535 | J-18 | C | J-22 | R114 | E-5 | R225 | B-6 | R521 | F-22 | S107 | A-14 |
| C203 | J-11 | C536 | H-16 | L | J-22 | R118 | B-15 | R226 | K-13 | R522 | I-22 | S108 | A-17 |
| C204 | I-11 | C538 | O-25 | R | J-21 | R119 | B-16 | R228 | J-9 | R523 | K-19 | S109 | A-18 |
| C205 | K-12 | C540 | O-20 | IC102 | M-3 | R121 | I-5 | R229 | K-8 | R524 | L-23 | S110 | A-20 |
| C206 | I-12 | C541 | S-21 | IC103 | H-5 | R122 | I-5 | R230* | G-10 | R525 | I-20 | S501 | J-18 |
| C209 | G-12 | C542 | S-26 | IC104 | D-8 | R123 | F-7 | R231 | K-11 | R526 | I-21 | SG501 | L-23 |
| C210 | B-7 | C544 | R-20 | IC105 | F-6 | R124 | K-5 | R234 | H-9 | R527 | I-21 | SWF201 | I-9 |
| C211 | J-12 | C545 | Q-20 | IC201 | H-11 | R125 | I-5 | R301 | G-18 | R529 | G-14 | T201 | K-9 |
| C212 | J-10 | C546 | F-25 | IC301 | E-19 | R126 | I-5 | R302 | A-24 | R530 | H-15 | T202 | G-11 |
| C213 | G-12 | C549 | I-17 | IC501 | C-25 | R127 | I-4 | R303 | D-18 | R531 | G-25 | T203 | J-11 |
| C214 | J-8 | C550 | H-19 | IC601 | S-14 | R128 | I-4 | R304 | B-23 | R532 | F-14 | T204 | I-13 |
| C215 | G-12 | C553 | N-24 | L102 | D-7 | R129 | H-2 | R305 | C-17 | R533 | H-16 | T205 | B-3 |
| C216 | F-11 | C557 | G-15 | L103 | C-9 | R130 | I-2 | R306 | C-18 | R534 | L-18 | T501 | F-24 |
| C217 | G-13 | C569 | I-25 | L107 | K-6 | R131 | H-3 | R307 | C-17 | R535 | K-18 | T502 | L-19 |
| C219 | K-9 | C570 | H-21 | L114 | K-6 | R132 | I-2 | R308 | D-20 | R536 | D-14 | T503 | Q-24 |
| C220 | K-9 | C571 | F-19 | L201 | H-13 | R133 | I-2 | R309 | D-20 | R537 | I-17 | T601 | O-13 |
| C221 | F-10 | C601 | N-11 | L202 | J-9 | R134 | G-4 | R310 | D-20 | R538 | O-22 | T602 | R-11 |
| C222 | F-9 | C602 | L-16 | L203 | J-9 | R135 | F-4 | R311 | C-19 | R539 | J-19 | TH201 | J-10 |
| C223 | H-13 | C603 | Q-16 | L206 | F-12 | R136 | G-4 | R312 | E-17 | R540 | I-15 | TH301 | D-18 |
| C224 | K-6 | C604 | Q-15 | L207 | G-12 | R137 | F-4 | R313 | E-17 | R541 | J-16 | TH501 | G-20 |
| C225 | H-12 | C606 | Q-14 | L301 | C-16 | R139 | E-5 | R314 | C-22 | R542 | J-7 | THP601 | P-14 |
| C226 | G-9 | C607 | R-13 | L302 | C-21 | R140 | E-5 | R315 | C-22 | R543 | C-24 | TP6 | D-14 |
| C227 | C-2 | C608 | I-15 | L303 | C-20 | R141 | E-6 | R316 | B-22 | R544 | I-19 | TP12 | E-16 |
| C228 | K-5 | C609 | Q-13 | L304 | C-20 | R142 | J-3 | R319 | G-17 | R545 | I-20 | TP86 | E-21 |
| C230 | K-9 | C611 | I-14 | L305* | D-10 | R143 | J-3 | R320 | D-17 | R546 | L-21 | TP96 | O-26 |
| C231 | G-10 | C614 | K-15 | L501 | Q-26 | R144 | J-3 | R321 | D-16 | R547 | K-21 | TP201 | K-8 |
| C249 | I-10 | C615 | K-14 | L502 | K-23 | R145 | I-3 | R322 | D-15 | R550 | H-25 | TP202 | H-9 |
| C301 | C-17 | C616 | M-8 | L503 | L-22 | R146 | J-3 | R323 | D-15 | R551 | G-15 | TP203 | E-12 |
| C302 | E-20 | C617 | R-19 | L504 | R-20 | R147 | F-1 | R324 | D-16 | R552 | I-20 | TP204 | G-10 |
| C303 | E-18 | CF201 | F-11 | L505 | R-22 | R149 | D-4 | R325 | E-15 | R553 | I-24 | TP205 | I-11 |
| C304 | C-17 | CF202 | F-12 | L507 | K-20 | R150 | G-7 | R326 | E-15 | R554 | I-22 | X101 | I-3 |
| C305 | B-21 | CP101 | G-6 | L526 | L-25 | R151 | F-7 | R327 | F-15 | R555 | J-18 | X301 | G-20 |
| C306 | F-15 | CP102 | F-4 | L527 | I-25 | R152 | E-8 | R328 | F-14 | R556 | E-22 | | |

*Located on other side of board.



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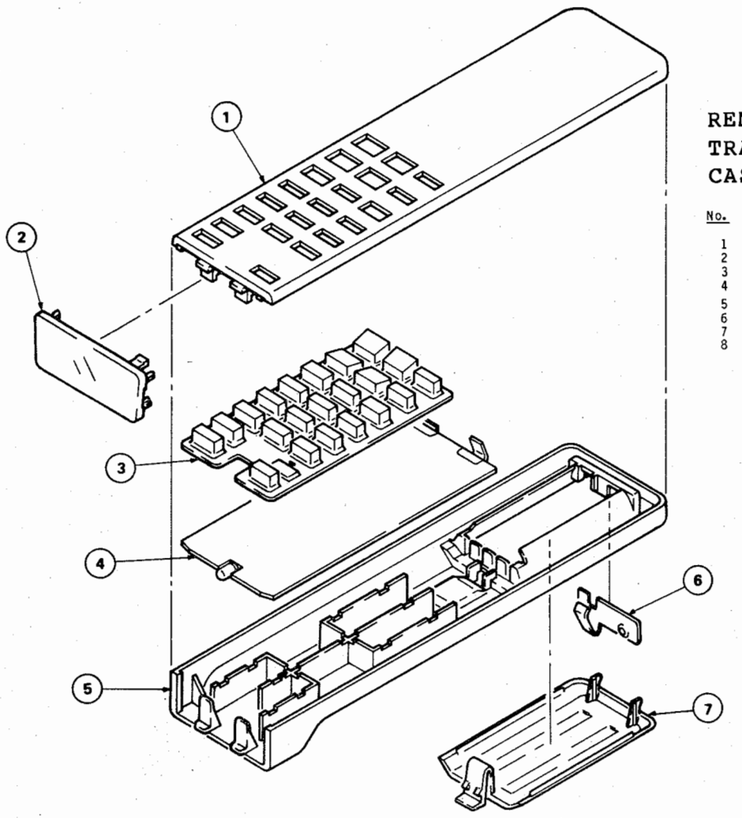
## REMOTE CONTROL TRANSMITTER CASE EXPLODED VIEW




## REMOTE CONTROL TRANSMITTER CASE PARTS LIST

| No. | Part No. | Description |
|---|---|---|
| 1 | 4-370-643-01 | CASE, UPPER |
| 2 | 4-370-640-01 | FILTER |
| 3 | 4-370-641-01 | SHEET, RUBBER |
| 4 | ♣:1-611-994-11 | RC BOARD |
| 5 | 4-370-642-01 | CASE, LOWER |
| 6 | 4-350-925-00 | TERMINAL (C), BATTERY |
| 7 | 4-370-639-01 | COVER, BATTERY |
| 8 | A-1470-655-A | COMMANDER ASSY (RM-717) |

## REMOTE CONTROL TRANSMITTER PARTS LIST

Items marked " ♣ " are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.

All variable and adjustable resistors have characteristic curve B, unless otherwise noted.

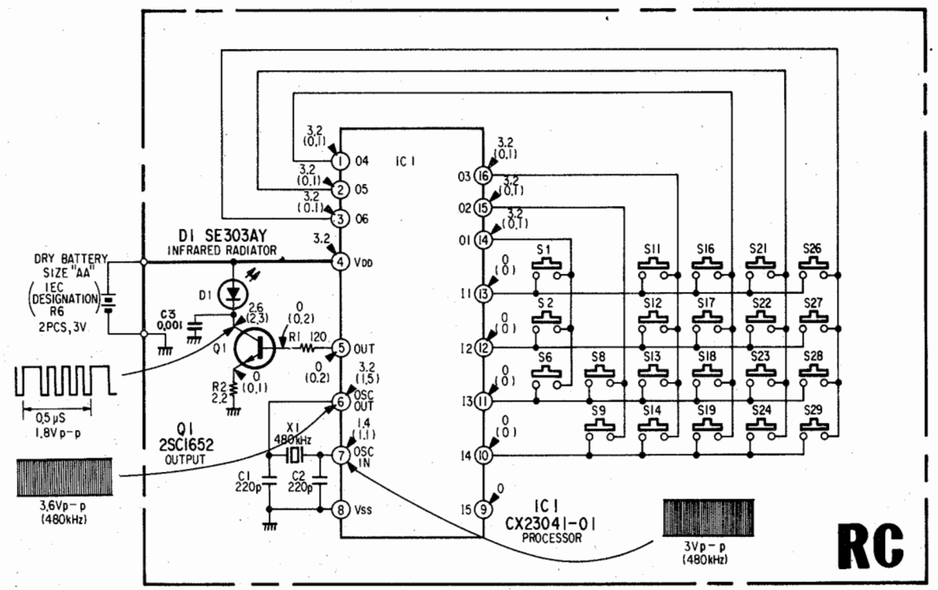
| Ref.No. | Part No. | Description | | | |
|---|---|---|---|---|---|
| | ♣:1-611-994-11 | RC BOARD | | | |
| | | ******** | | | |
| | 4-370-637-01 | TERMINAL (A), BATTERY | | | |
| | 4-370-638-01 | TERMINAL (B), BATTERY | | | |
| | | CAPACITOR | | | |
| C1 | 1-102-110-00 | CERAMIC | 220PF | 10% | 50V |
| C2 | 1-102-110-00 | CERAMIC | 220PF | 10% | 50V |
| C3 | 1-102-074-00 | CERAMIC | 0.001MF | 10% | 50V |

| No. | Part No. | Description | | | |
|---|---|---|---|---|---|
| | | DIODE | | | |
| D1 | 8-719-107-82 | DIODE SE303AY | | | |
| | | IC | | | |
| IC1 | 8-759-910-39 | IC CX23041-01 | | | |
| | | TRANSISTOR | | | |
| Q1 | 8-729-965-22 | TRANSISTOR 2SC1652 | | | |
| | | RESISTOR | | | |
| R1 | 1-247-809-00 | CARBON | 120 | 5% | 1/6W |
| R2 | 1-247-767-00 | CARBON | 2.2 | 5% | 1/6W |
| | | CRYSTAL | | | |
| X1 | 1-527-476-00 | OSCILLATOR, CERAMIC | | | |

Courtesy of the Manufacturer



## REMOTE CONTROL TRANSMITTER SCHEMATIC



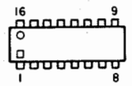

### KEY MATRIX TABLE

| | 01 | 02 | 03 | 04 | 05 | 06 |
|---|---|---|---|---|---|---|
| I1 | S1 CH+ | S6 0 | S11 7 | S16 4 | S21 1 | S26 MUTE |
| I2 | S2 CH− | | S12 8 | S17 5 | S22 2 | S27 SLEEP |
| I3 | | S8 ENTER | S13 9 | S18 6 | S23 3 | S28 POWER |
| I4 | | S9 VOL− | S14 VOL+ | S19 PIC− | S24 PIC+ | S29 DISPLAY |

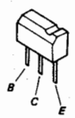
**Note:**

- All capacitors are in µF unless otherwise noted. p: µµF 50WV or less are not indicated except for electrolytics.
- All resistors are in ohms, 1/6W unless otherwise noted. kΩ: 1000Ω; MΩ: 1000kΩ
- Readings are taken with a 10MΩ digital multimeter. No marking: S1 is depressed. ( ): no depressed.
- All voltages are in V.
- Voltages are dc with respect to ground unless otherwise noted.
- Voltage variations may be noted due to normal production tolerances.
- ——: B+ bus.

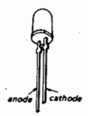
**CX23041-01**

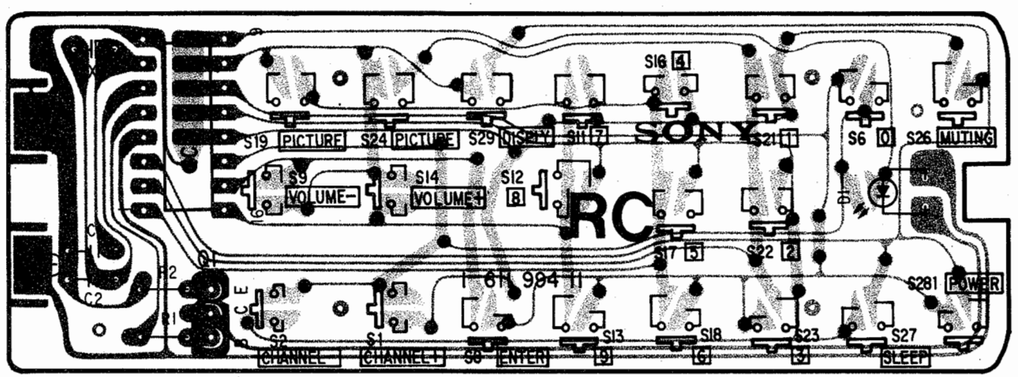



**2SC1652**



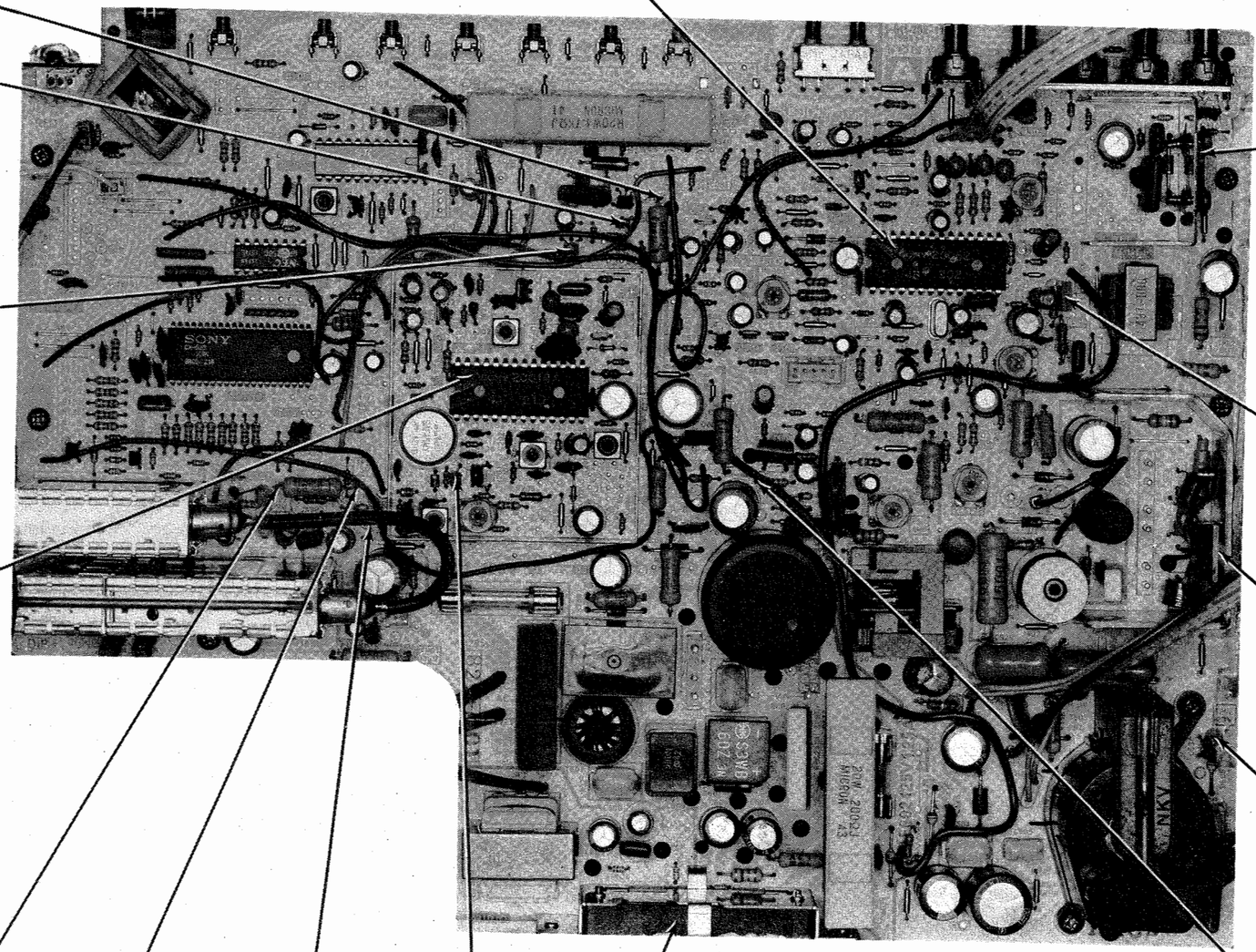

**SE303AX**
**SE303AY**




Courtesy of the Manufacturer

## REMOTE CONTROL TRANSMITTER BOARD



**IC301** PIN 3
SYNC
4.2V HORIZ

**IC301** PIN 6
HORIZ
3.3V HORIZ

**IC301** PIN 11
CHROMA
5.2V HORIZ

**IC301** PIN 13
VERT
.8V VERT

**IC301** PIN 15
VERT
1.2V VERT

**IC301** PIN 17
CHROMA
2.4V HORIZ

**IC301** PIN 18
CHROMA
1.6V HORIZ

**IC301** PIN 19
CHROMA
2.1V HORIZ

**IC301** PIN 20
9.5V
VIDEO

**IC301** PIN 28
VIDEO
1.1V HORIZ

**R610 (TP6)**
−42.4V

**Q310(B)**
VIDEO
1.2V HORIZ

**Q310(E)**
5.3V
VIDEO

**Q307(B)**
VIDEO
1.2V HORIZ

**Q307(E)**
5.9V
VIDEO

**IC201** PIN 20
VIDEO
IF
1.2V HORIZ

**IC201** PIN 21
9.4V

**IC201** PIN 27
.1V TO 4.7V
IF AGC RANGE

**IC501** PIN 2
VERT
44V VERT

**IC501** PIN 3
VERT
24V VERT

**IC501** PIN 3
23.5V
VERT

**IC501** PIN 4
VERT
1V VERT

**Q501(B)**
HORIZ
3V HORIZ

**Q501(C)**
126V
HORIZ

**Q502(B)**
HORIZ
25V HORIZ

**Q502(C)**
134V
HORIZ

**D505** (CATH)
**(TP96)**
23.3V

**R542 (TP7)**
9.5V

**R542 (TP5)**
5.2V

**TP15**
4.2V TO 8.0V
RF AGC RANGE

**Q201(C)**
9.5V
VIF

**IC601** PIN 6
**(TP91)**
134V

**IC601** PIN 7
100V
AUDIO

**IC601** PIN 9
78.7V
AUDIO

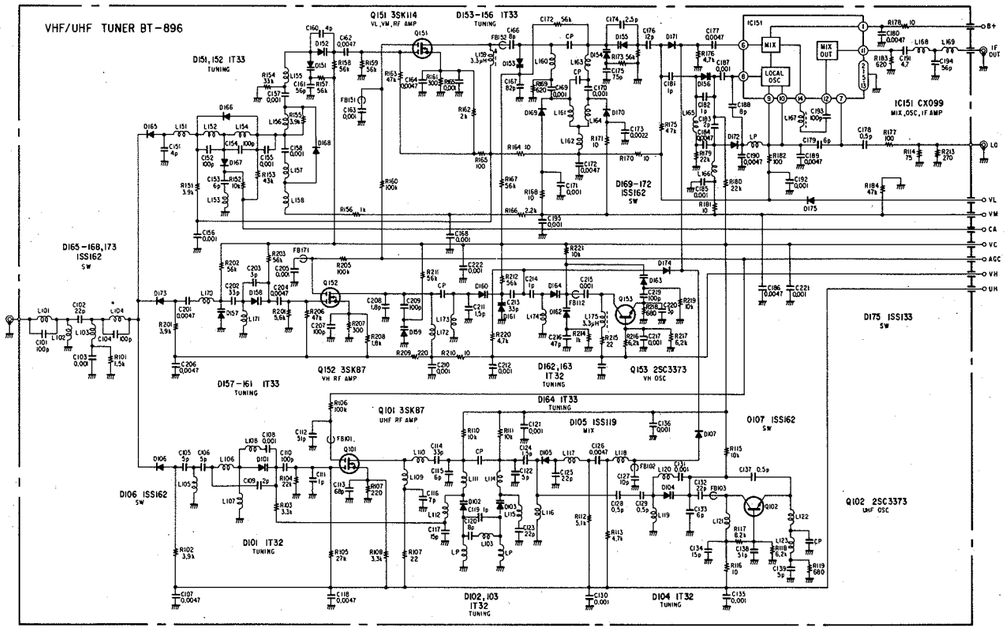
**IC601** PIN 12
2.8V
AUDIO

**R541 (TP92)**
12.2V

A Howard W. Sams QUICK-CHECKS™ Photo

## VHF/UHF TUNER SCHEMATIC DIAGRAM

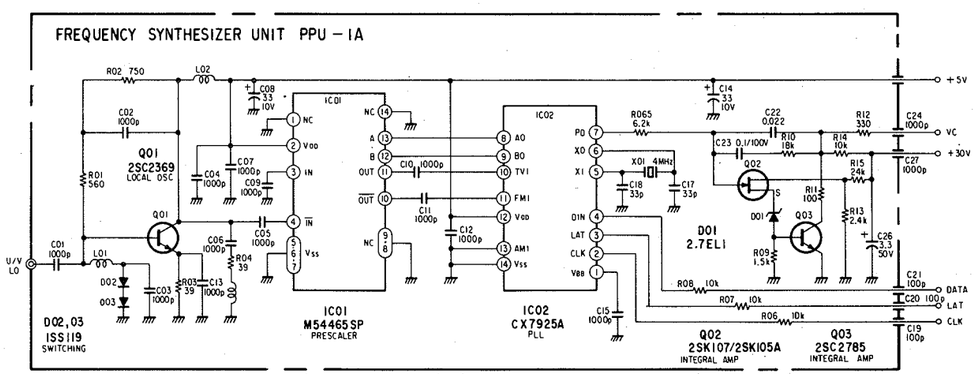
• **BT-896**




**Note:** Tuner reference numbers are not included in the Electrical Parts List.

## FREQUENCY SYNTHESIZER UNIT SCHEMATIC DIAGRAM

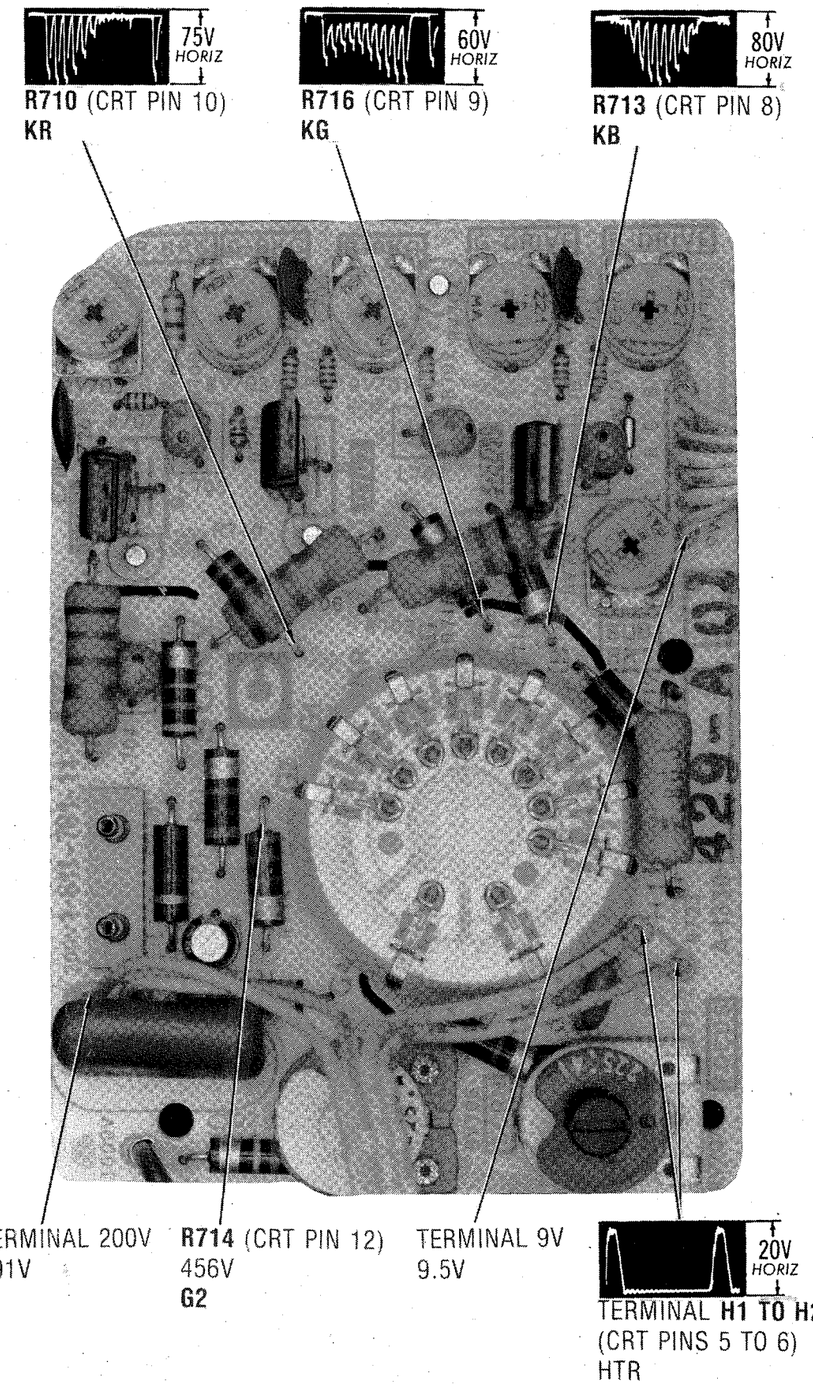
• **PPU-1A**




**Note:** PPU-1A reference numbers are not included in the Electrical Parts List.

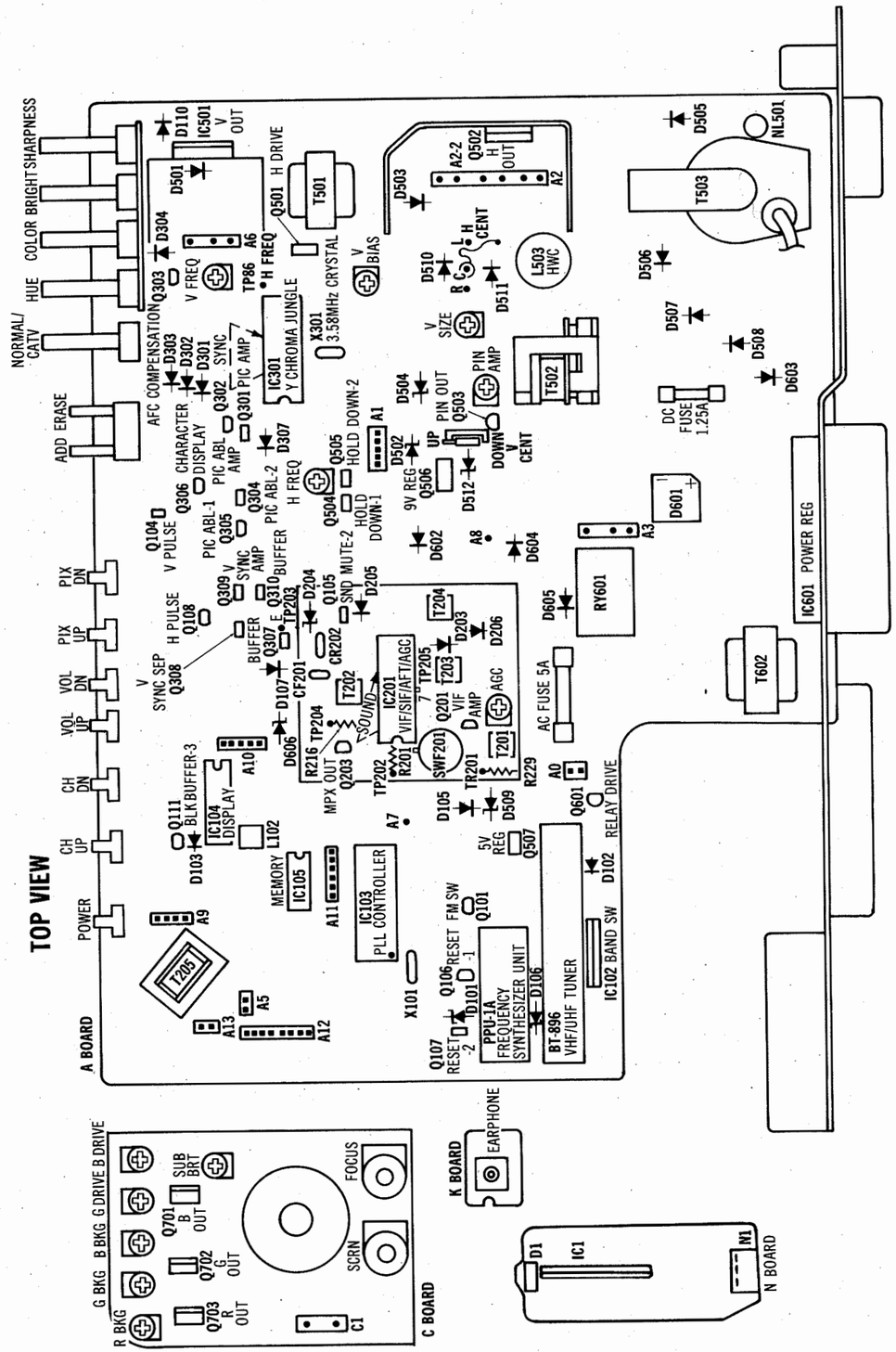
Courtesy of the Manufacturer






A Howard W. Sams QUICK-CHECKS™ Photo

CRT BOARD




PLACEMENT CHART



## RESISTANCE MEASUREMENTS

**MEASUREMENTS TAKEN WITH LOW POWER OHMS METER**

| ITEM | PIN 1 | PIN 2 | PIN 3 | PIN 4 | PIN 5 | PIN 6 | PIN 7 | PIN 8 | PIN 9 | PIN 10 | PIN 11 | PIN 12 | PIN 13 | PIN 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IC102 | 664 | 861 | INF | INF | 0 | 575 | 47K | 1.7M | 349 | | | | | |
| IC103 | INF | INF | 39K | 30K | INF | 0 | INF | 102K | INF | INF | INF | INF | 58K | INF |
| | PIN 15 | PIN 16 | PIN 17 | PIN 18 | PIN 19 | PIN 20 | PIN 21 | PIN 22 | PIN 23 | PIN 24 | PIN 25 | PIN 26 | PIN 27 | PIN 28 |
| | INF | INF | 4370 | 5940 | 0 | INF | 0 | *66K | INF | *38K | *66K | *43K | *43K | *43K |
| | PIN 29 | PIN 30 | PIN 31 | PIN 32 | PIN 33 | PIN 34 | PIN 35 | PIN 36 | PIN 37 | PIN 38 | PIN 39 | PIN 40 | PIN 41 | PIN 42 |
| | *43K | *43K | *56K | 151K | 151K | 0 | INF | INF | *50K | *57K | *57K | *57K | *57K | *33K |
| IC104 | INF | INF | INF | 0 | INF | INF | INF | INF | 97K | 0 | 0 | 1NF | INF | 92K |
| | | | | | | | PIN 15 | PIN 16 | PIN 17 | PIN 18 | PIN 19 | PIN 20 | PIN 21 | PIN 22 |
| | | | | | | | INF | INF | *59K | *50K | 0 | 19K | 0 | 942 |
| IC105 | INF | *33K | *33K | *33K | 184K | 168K | 170K | *66K | 0 | 0 | *43K | *43K | *43K | *43K |
| | | | | | | | | | | | | | PIN 15 | PIN 16 |
| | | | | | | | | | | | | | *43K | *66K |
| IC201 | 20K | 20K | 0 | 7670 | 150K | 150K | 17K | 2280 | 2290 | 18K | 869 | INF | INF | 1.3 |
| | PIN 15 | PIN 16 | PIN 17 | PIN 18 | PIN 19 | PIN 20 | PIN 21 | PIN 22 | PIN 23 | PIN 24 | PIN 25 | PIN 26 | PIN 27 | PIN 28 |
| | 18K | 0 | INF | INF | 345 | INF | 345 | 23K | 23K | 2180 | 2180 | 150K | 176K | 17K |
| IC301 | 60K | 365K | 101K | 11K | 81K | 14K | 0 | 42K | 9800 | 5130 | 37K | 26K | 5970 | 2270 |
| | PIN 15 | PIN 16 | PIN 17 | PIN 18 | PIN 19 | PIN 20 | PIN 21 | PIN 22 | PIN 23 | PIN 24 | PIN 25 | PIN 26 | PIN 27 | PIN 28 |
| | 1146 | 0 | 103K | 11K* | 106K | 345 | *58K | INF | 7410 | 4720 | 5770 | 5730 | 4590 | 1752 |
| IC501 | 0 | 3150 | INF | 6960 | 0 | 4440 | 1.8M | | | | | | | |
| IC601 | 13K | 15K | NC | 0 | NC | 13K | 40K | 13K | 110K | 991 | 0 | 3920 | | |
| ¥901 | 1.9M | NC | 0 | NC | FIL | FIL | 77K | 516K | 516K | 516K | 77K | 1.3M | | |
| | | | | | | | | | | | | | | |
| ITEM | E | B | C | | ITEM | E | B | C | | ITEM | E | B | C | |
| Q101 | 0 | INF | 5960 | | Q303 | 8670 | 59K | 17K | | Q503 | 56 | 2170 | 4780 | |
| Q104 | 0 | 10K | 47K | | Q304 | 7860 | 118K | 4700 | | Q504 | INF | 186K | 23K | |
| Q105 | INF | 100K | 18K | | Q305 | 0 | 46K | 18K | | Q505 | 15K | INF | 23K | |
| Q106 | 0 | 9750 | INF | | Q306 | 12K | INF | 345 | | Q506 | 347 | 580 | 359 | |
| Q107 | *33K | INF | 9360 | | Q307 | 1354 | INF | 0 | | Q507 | 380 | 1345 | 347 | |
| Q108 | 0 | 4650 | 22K | | Q308 | 345 | 8.2M | 2500 | | Q601 | 0 | INF | 55K | |
| Q201 | 82 | 270 | 345 | | Q309 | 0 | 922 | 17K | | Q701 | 284 | 103K | 513K | |
| Q203 | 1000 | INF | 345 | | Q310 | 1606 | 2380 | 345 | | Q702 | 278 | 11K | 513K | |
| Q301 | 6040 | 62K | 0 | | Q501 | 0 | 3300 | 13K | | Q703 | 248 | 103K | 513K | |
| Q302 | 0 | 1M | 62K | | Q502 | 0 | 1.2 | 13K | | | | | | |

* Taken with Normal/CATV Switch in NORMAL position.

## TROUBLESHOOTING (Continued)

Transistor (Q201), pins 1 thru 11 and 19 thru 28 of IC201 and Buffer Transistor (Q307), Vertical Sync Sep Transistor (Q308), Vertical Sync Amp Transistor (Q309) and Buffer Transistor (Q310). A defective AGC circuit can cause an overloaded picture, excessive snow or loss of picture and sound. See AGC Voltage Chart for voltages that change with signal.

AGC VOLTAGE CHART

Voltages taken using a Keyed-Rainbow generator for signal.

| | | |
|---|---|---|
| IC201 | Pin 26 | 4.68V |
| IC201 | Pin 27 | 4.68V |
| IC201 | Pin 28 | 4.68V |

AUDIO

If there is no audio, inject an audio signal at pin 12 of Power Reg IC (IC601) and check for sound at the speaker. If sound is absent, check the voltages, waveforms and components associated with pins 7 thru 12 of IC601 and the speaker. If the sound is present at the speaker, inject a modulated audio IF signal at pin 17 of VIF/SIF/AFT/AGC IC (IC201) and check for sound at the speaker. If the sound is present at the speaker, check the components associated with pin 17 of IC201. If the sound is not present at the speaker, check voltages, waveforms and components associated with pins 10 thru 18 of IC201. Check the voltage on pin 10, it should be above .20V is sound is not being muted. If sound is being muted, check pin 18 of PLL Controller IC (IC103). If there is no sound at the MPX Output Jack, check voltages, waveforms and components associated with pins 12 and 13 of IC201 and MPX Output Transistor (Q203).

VIDEO

If there is no video, inject a video signal at TP12 and check for a picture on the CRT. If a picture is present, refer to the "IF-AGC" section of this Troubleshooting guide. If the picture is absent, check for video on pins 17, 18 and 19 of Y Chroma Jungle IC (IC301). If video is absent at pins 17, 18 and 19 of IC301, check the voltages, waveforms and components associated with pins 17 thur 28 of IC301. If video is present at pins 17, 18 and 19, check the voltages, waveforms and components associated with Blue, Green, Red Output Transistors (Q701, Q702, Q703) and the CRT. If there is insufficient or too much brightness, check the voltages and components associated with Picture Amp Transistor (Q301), Peak ABL Amp Transistor (Q302), AFC Compensation Transistor (Q303), Picture ABL-2 Transistor (Q304) and Picture ABL-1 Transistor (Q305). If there is no channel display on the CRT, check Character Display Transistor (Q306, Display IC (IC104) and associated components.

VERTICAL

If there is no vertical deflection, inject a vertical drive signal at pin 13 of Y Chroma Jungle IC (IC304). If the vertical deflection returns, check voltages, waveforms and components associated with pins 12 thru 15 of IC301. If the vertical deflection does not return, check voltages, waveforms and components associated with Vertical Output IC (IC501) and the Deflection Yoke (DY101). If the vertcial oscillator is off frequency, check the voltages, waveforms and components associated with pin 12 of IC301. Vertical linearity or foldover problems may be caused by vertical feedback and bias circuits, check Electrolytics C506, C515, C534, C535 and C570 for defects.

SYNC

If there is no vertical or horizontal sync, check voltages and components associated with pin 3, 9 and 12 of Y Chroma Jungle IC (IC301). If there is no vertical sync, check voltages and components associated with pin 12 of IC301. If there is no horizontal sync, check voltages and components associated with pin 9 of IC301. If no defective parts are found, replace IC301.

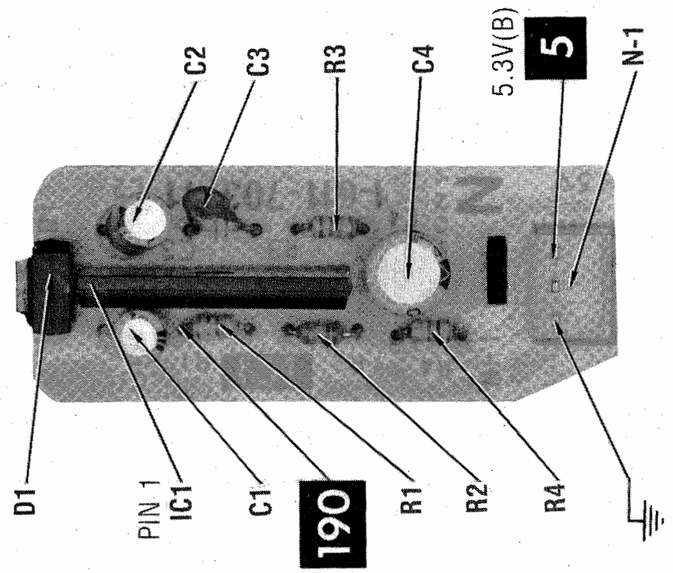
RASTER

If there is no raster, but High Voltage is present, check the CRT and CRT voltages. If there is no green, check voltages and components associated with pin 18 of Y Chroma Jungle IC (IC301), Green Output Transistor (Q702) and Character Display Transistor (Q306). If there is no blue, check voltages and components associated with pin 17 of IC301 and Blue Output Transistor (Q701). If there is no red, check voltages and components associated with pin 19 of IC301 and Red Output Transistor (Q703). If the raster has a pincushion shape, check voltages and components associated with Pin Out Transistor (Q503). If the raster has a keystone shape, check the Deflection Yoke (DY101). If the raster has height or width problems, refer to the "Vertical", "Horizontal" or "Power Supply" sections of this Troubleshooting guide.

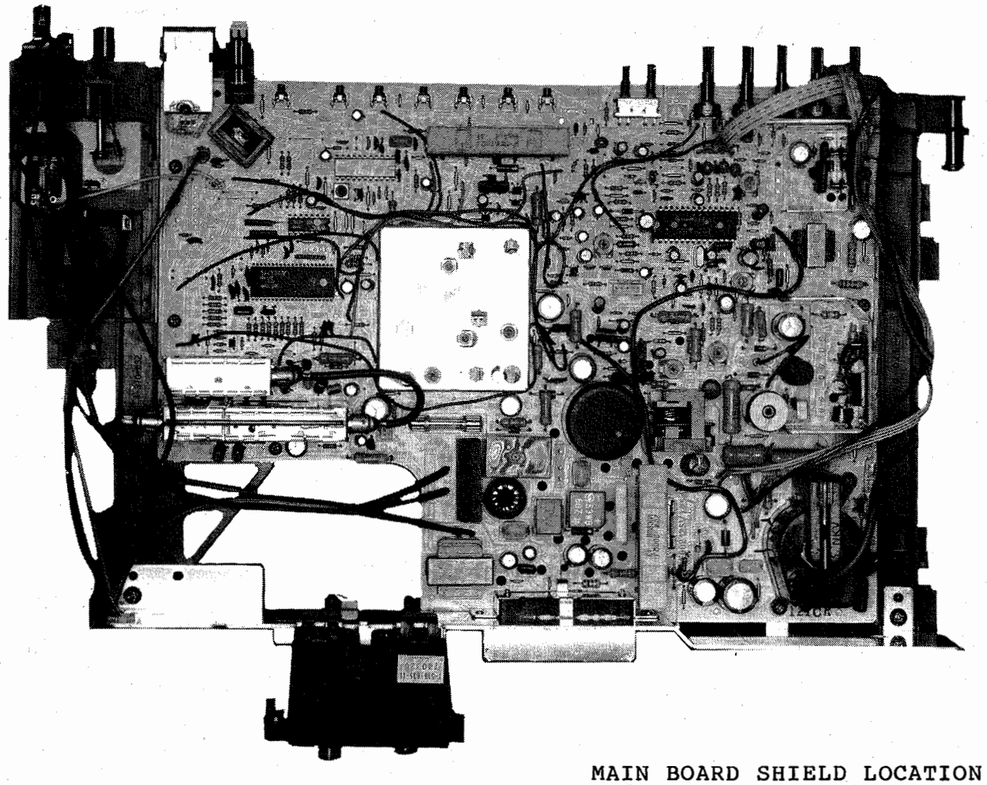
CHROMA

If there is no color, check for the proper color waveforms at pins 17, 18 and 19 of Y Chroma Jungle IC (IC301). If present, check the voltages, waveforms and components associated with Blue, Green, Red Output Transistors (Q701, Q702, Q703) and the CRT. If the waveforms are not present at pins 17, 18 and 19 of IC301, check voltages, waveforms and components associated with pins 8, 17, 18, 19, 24, 25 and 26 of IC301. Check to be sure the 15.7kHz oscillator at pin 8 of IC301 is operating. If there is improper hue, check voltages and components associated with pin 24 of IC301. If there is no green, check voltages and components associated with pin 18 of IC301 and the Green Output Transistor (Q702). If there is no blue, check voltages and components associated with pin 17 of IC301 and Blue Output Transistor (Q701). If there is no red, check voltages and components associated with pin 19 of IC301 and Red Output Transistor (Q703).






A Howard W. Sams CIRCUITRACE Photo REMOTE CONTROL HEAD AMP BOARD



MAIN BOARD SHIELD LOCATION

## TEST JIG HOOKUP

| FUNCTION | Chek-A-Color ADAPTER NO. | RCA / TeleMatic ADAPTER NO. | ZENITH ADAPTER NO. |
|---|---|---|---|
| CRT<br>YOKE<br>YOKE SETTING | B245<br>D4137 (1)<br>YP1, Focus Tap | 10J710<br>10J733<br>Horiz 1.9, Vert 8.0,<br>FVS-3950 Focus<br>Voltage Supply, 10J711<br>Anode Adapter | 852-431 (1)<br>Horiz 1.8, Vert 8.0,<br>Focus Tap |

"A-2" (1) PIN 1 or 2 RED — PIN 3 or 4 BLUE — PIN 5 YELLOW — PIN 6 GREEN (P.C. BOARD) "A"

## TROUBLESHOOTING

POWER SUPPLY

If there is no raster or sound, check AC Fuse (F601). If Fuse is open, check Bridge Rectifier Diode (D601) and Diodes D602 and D604, Capacitor C601 and Thermistor THP601. Apply 120V AC and check for 157V at the cathode of Diode D601. If voltage is absent, check Line Filter (T601), Coils L601, L602 and Relay RY601. Check to be sure Relay is being actuated when power On/Off button is depressed. Check the Relay Drive Transistor (Q601), check for -42.4V at TP6, 128V at the cathode of Diode D604 and 5.3V at the cathode of Diode D606. If Relay RY601 is not being actuated, check circuits associated with Relay RY601. If 157V is present at the cathode of Diode D601, check DC Fuse (F602). If Fuse is open, check Power Reg IC (IC601) and Horizontal Output Transistor (Q502). If DC Fuse F602 is good, check for 134V at pin 6 of IC601. If 134V is absent, check voltages, waveforms and components associated with IC601. If 134V is present at pin 6 of IC601, refer to the "Horizontal" section of this Troubleshooting guide. NOTE: If the voltage on pin 10 of Y Chroma Jungle IC (IC301) is about .61V and the voltage at TP84 is 162V, the TV is in shutdown, refer to "High Voltage Shutdown" section of this Troubleshooting guide.

HORIZONTAL

If there is no horizontal sweep or High Voltage, determine if the TV is in shutdown by referring to "High Voltage Shutdown" section of this Troubleshooting guide. If the receiver is not in shutdown, inject a horizontal signal at the base of Horizontal Output Transistor (Q502). If horizontal deflection returns, check the voltages, waveforms and components associated with pins 4 thru 11 and 20 of Y Chroma Jungle IC (IC301) and Horizontal Drive Transistor (Q501). If horizontal deflection does not return, check voltages, waveforms and components associated with Transistor Q502 and Horizontal Output Transformer (T503). If the horizontal oscillator is off frequency, check voltages and components associated with pins 9 and 11 of IC301. Horizontal linearity or fold-over problems may be caused by the Capacitors C526, C529, C553 and C569 being defective. Check Diodes D505, D506, D507 and D508 for defects. Check for 23.3V at TP96, 973V at the cathode of Diode D506, 192V at the cathode of Diode D507 and 12.2V at the cathode of Diode D508. NOTE: If the voltage on pin 10 of IC301 is approximately .61V and TP84 is 162V, the TV is in shutdown.

HIGH VOLTAGE SHUTDOWN

If the voltage at TP84 is 162V and pin 10 of Y Chroma Jungle IC (IC301) is .61V, the TV is in shutdown. If TV is in shutdown, remove Resistor R533 from circuit and use a variac for AC power. Start at approximately 50V AC and increase as necessary to locate and correct defect. The High Voltage is monitored by applying the DC voltage at Hold Down Check Point A, to the base of Hold Down-1 Transistor (Q504). Should the High Voltage increase, the DC voltage at Check Point A will increase, thus increasing the base voltage of Transistor Q504. This triggers both Hold Down Transistors (Q504 and Q505) into conduction which causes the voltage at pin 10 of IC301 to increase from 4.2V to 5.3V, the shutdown point. When the voltage reaches this level it shuts down the set and keeps it in shutdown with .61V on pin 10 of IC301. NOTE: Care should be taken in defeating the Shutdown circuit as this may cause excessive x-radiation and damage to the CRT, Horizontal Output Transformer (T503) and associated components. use a variac for AC power, monitor High Voltage and troubleshoot as necessary to locate and correct defect.

IF-AGC

If there is no video or sound, inject an IF signal at the IF input and check for video on the CRT. If video is present, check the Tuner, Tuner Control circuits, Tuner AFC circuits and Tuner AGC circuits. If video is not present on the CRT, check for a video waveform at TP12. If the video waveform is present, refer to the "Video" section of this Troubleshooting guide. If the video waveform is absent at TP12, apply AGC bias to pin 4 of VIF/ SIF/ AFT/ AGC IC (IC201). If the video is now present at TP12, check voltages and components associated with pin 4 of IC201. If the video is still absent at TP12 with AGC bias applied to pin 4 of IC201, check the voltages, waveforms and components associated with VIF Amp





## SEMICONDUCTORS (Select replacement transistor for best results)

| ITEM No. | TYPE No. | MFGR. PART No. | REPLACEMENT DATA | | | | |
|---|---|---|---|---|---|---|---|
| | | | GENERAL ELECTRIC PART No. | WORKMAN PART No. | RCA PART No. | PHILIPS ECG PART No. | NEW-TONE NTE PART No. | ZENITH PART No. |
| D101 | RD3.9EN2 | 8-719-102-60 | GEZD-3.9 | WEP1407/5007 | SK3A9/5007A | ECG5007A | NTE5007A | 103-131 |
| | RD3.9E-N2 | | GEZD-3.9 | WEP1407/5007 | SK3A9/5007A | ECG5007A | NTE5007A | |
| D102,3 | 1S1555 | 8-719-911-19 | GE-300 | WEP1062/177 | SK9091/177 | ECG177 | NTE177 | 103-131 |
| | 1SS119 | | GE-514 | WEP925/519 | SK3100-519 | ECG519 | NTE519 | 103-131 |
| D105 | 1S1555 | 8-719-911-19 | GE-300 | WEP1062/177 | SK9091/177 | ECG177 | NTE177 | 103-131 |
| | 1SS119 | | GE-514 | WEP925/519 | SK3100/519 | ECG519 | NTE519 | 103-131 |
| D106 | RD33EB2 | 8-719-101-04 | GEZD-33 | WEP1438/5036 | SK33A/5036A | ECG5036A | NTE5036A | 103-Z9004 |
| | RD33E-B2 | | GEZD-33 | WEP1438/5036 | SK33A/5036A | ECG5036A | NTE5036A | 103-Z9004 |
| D107 | 1S1555 | 8-719-911-19 | GE-300 | WEP1062/177 | SK9091/177 | ECG177 | NTE177 | 103-131 |
| | 1SS119 | | GE-514 | WEP925/519 | SK3100/519 | ECG519 | NTE519 | 103-131 |
| D110 | 1S1555 | 8-719-911-19 | GE-300 | WEP1062/177 | SK9091/177 | ECG177 | NTE177 | 103-131 |
| | 1SS119 | | GE-514 | WEP925/519 | SK3100/519 | ECG519 | NTE519 | 103-131 |
| D203 | 1S2473 | 8-719-911-19 | GE-514 | WEP925/519 | SK3100/519 | ECG519 | NTE519 | 103-131 |
| | 1SS119 | | GE-514 | WEP925/519 | SK3100/519 | ECG519 | NTE519 | 103-131 |
| D204 | RD5.6EN1 | 8-719-102-71 | GEZD-5.6 | WEP1412/5011 | SK5A6/5011A | ECG5011A | NTE5011A | 103-Z9007 |
| | RD5.6E-N2 | | GEZD-5.6 | WEP1412/5011 | SK5A6/5011A | ECG5011A | NTE5011A | 103-Z9007 |
| D205,6 | 1S1555 | 8-719-911-19 | GE-300 | WEP1062/177 | SK9091/177 | ECG177 | NTE177 | 103-131 |
| | 1SS119 | | GE-514 | WEP925/519 | SK3100/519 | ECG519 | NTE519 | 103-131 |
| D301 Thru D303 | 1S1555 | 8-719-911-19 | GE-300 | WEP1062/177 | SK9091/177 | ECG177 | NTE177 | 103-131 |
| | 1SS119 | | GE-514 | WEP925/519 | SK3100/519 | ECG519 | NTE519 | 103-131 |
| D304 | RD5.6EN2 | 8-719-102-71 | GEZD-5.6 | WEP1412/5011 | SK5A6/5011A | ECG5011A | NTE5011A | 103-Z9007 |
| | RD5.6E-N2 | | GEZD-5.6 | WEP1412/5011 | SK5A6/5011A | ECG5011A | NTE5011A | 103-Z9007 |
| D307 | SIB01-02 | 8-719-901-39 | GE-504A | WEP156 | SK3311 | ECG116 | NTE116 | 212-76-02 |
| | V06J | | GE-504A | WEP156 | SK3311 | ECG116 | NTE116 | 212-76-02 |
| D501 | GP08D | 8-719-901-39 | GE-512 | WEP4008/5809 | SK3051/156 | ECG156 | NTE156 | 212-Z9000 |
| | V06J | | GE-504A | WEP156 | SK3311 | ECG116 | NTE116 | 212-76-02 |
| D502 # | RD5.6EBZ7S | 8-719-156-27 | GEZD-5.6 | WEP1412/5011 | SK5A6/5011A | ECG5011A | NTE5011A | 103-Z9007 |
| D503 | RGP01-17 | | GE-533 | WEP177/525 | SK3925/525 | ECG525 | NTE525 | 212-Z9010 |
| | ES1F | 8-719-300-65 | GE-533 | WEP177/525 | SK3925/525 | ECG525 | NTE525 | 212-Z9010 |
| D504 # | RD24EBZ7 | 8-719-190-00 | GEZD-24 | WEP1433/5031 | SK24A/5031A | ECG5031A | NTE5031A | 103-212 |
| | RD24E-BZ7 | 8-719-901-93 | GEZD-24 | WEP1433/5031 | SK24A/5031A | ECG5031A | NTE5031A | 103-212 |
| D505 | V19E | | GE-511 | WEP172/506 | SK9000/552 | ECG552 | NTE552 | 103-287 |
| D506 | RGP01-17 | 8-719-300-65 | GE-533 | WEP177/525 | SK3925/525 | ECG525 | NTE525 | 212-Z9010 |
| | ES1F | | GE-533 | WEP177/525 | SK3925/525 | ECG525 | NTE525 | 212-Z9010 |

## TROUBLESHOOTING AID

Note: Waveforms taken with triggered scope, Keyed-Rainbow generator. Schematic voltages measured with digital meter, no signal. Controls adjusted for normal operation.

**PICTURE or SOUND**

NO PIC, NO SOUND, NO RASTER: Check AC power supply and sources generated from Horizontal Output Transformer (T503). Refer to "Troubleshooting" Power Supply and Horizontal circuits.

NO PIC, NO SOUND, HAS RASTER: Check IF-AGC and source voltages from Horizontal Output Transformer (T503). Refer to "Troubleshooting" IF-AGC and Horizontal circuits.

NO PIC, HAS SOUND, NO RASTER: Check Horizontal Output Transformer (T503) sources and Video circuit. Refer to "Troubleshooting" Horizontal and Video circuits.

NO PIC, HAS SOUND, HAS RASTER: Refer to "Troubleshooting" Video circuit.

HAS PIC, NO SOUND: Refer to "Troubleshooting" Audio circuit.

OVERLOADED PICTURE: Refer to "Troubleshooting" IF-AGC circuit.

LOW OR EXCESSIVE BRIGHTNESS: Check Video and Luminance circuits. Refer to "Troubleshooting" Video circuit.

**SWEEP**

NO RASTER, HAS SOUND: Check HV rectifier, Part of Horizontal Output Transformer (T503). Refer to "Troubleshooting" Horizontal circuit.

NO RASTER, NO SOUND: Refer to "Troubleshooting" Horizontal circuit.

NO VERT DEFLECTION: Refer to "Troubleshooting" Vertical circuit.

POOR VERT LIN OR FOLDOVER: Refer to "Troubleshooting" Vertical circuit.

POOR HORIZ LIN OR FOLDOVER: Refer to "Troubleshooting" Horizontal circuit.

NARROW PICTURE: Refer to "Troubleshooting" Horizontal circuit.

VERT OFF FREQUENCY: Refer to "Troubleshooting" Vertical circuit.

HORIZ OFF FREQUENCY: Refer to "Troubleshooting" Horizontal circuit.

**SYNC**

NO VERT/HORIZ SYNC: Refer to "Troubleshooting" Sync circuit.

**RASTER**

YELLOW (NO BLUE): Check Chroma and Blue Output circuits. Refer to "Troubleshooting" Raster circuit.

CYAN (NO RED): Check Chroma and Red Output circuits. Refer to "Troubleshooting" Raster circuit.

MAGENTA (NO GREEN): Check Chroma and Green Output circuits. Refer to "Troubleshooting" Raster circuit.

**COLOR (B/W operating normally)**

NO COLOR: Refer to "Troubleshooting" Chroma circuit.

WEAK COLOR: Refer to "Troubleshooting" Chroma circuit.

NO COLOR SYNC: Refer to "Troubleshooting" Chroma circuit.

NO GREEN: Check Chroma and Green Output circuits. Refer to "Troubleshooting" Raster circuit.

NO BLUE: Check Chroma and Blue Output circuits. Refer to "Troubleshooting" Raster circuit.

NO RED: Check Chroma and Red Output circuits. Refer to "Troubleshooting" Raster circuit.

INCORRECT HUE (TINT): Refer to "Troubleshooting" Chroma circuit.





## PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

### SEMICONDUCTORS (Select replacement transistor for best results)

| ITEM No. | TYPE No. | MFGR. PART No. | GENERAL ELECTRIC PART No. | REPLACEMENT DATA: NEW-TONE NTE PART No. | PHILIPS ECG PART No. | RCA PART No. | WORKMAN PART No. | ZENITH PART No. |
|---|---|---|---|---|---|---|---|---|
| D507 | RH1A | 8-719-300-76 | GE-511 | NTE552 | ECG552 | SK9000/552 | WEP172/506 | 103-287 |
| D508 | RH-1A<br>V19C<br>V19E | 8-719-901-93 | GE-511<br>GE-511 | NTE552<br>NTE552 | ECG552<br>ECG552 | SK9000/552<br>SK9000/552 | WEP172/506<br>WEP172/506 | 103-287<br>103-287 |
| D509 | RD5.6EN2<br>RD5.6E-N2<br>GP08D | 8-719-102-71 | GEZD-5.6<br>GEZD-5.6<br>GE-512 | NTE5011A<br>NTE5011A<br>NTE156 | ECG5011A<br>ECG5011A<br>ECG156 | SK5A6/5011A<br>SK5A6/5011A<br>SK3051/156 | WEP1412/5011<br>WEP1412/5011<br>WEP4008/5809 | 103-Z9007<br>103-Z9007<br>212-Z9000 |
| D510,11 | V06J | 8-719-901-39 | GE-504A | NTE116 | ECG116 | SK3311 | WEP156 | 212-76-02 |
| D512 | RD10EN3<br>RD10E-N3 | 8-719-102-91 | GEZD-10<br>GEZD-10 | NTE5019A<br>NTE5019A | ECG5019A<br>ECG5019A | SK10A/5019A<br>SK10A/5019A | WEP1420/5019<br>WEP1420/5019 | 103-Z9010<br>103-Z9010 |
| # D601 | S3WB60Z | 8-719-503-06 | | NTE5315 | ECG5315 | SK3988/5315 | WEP1054/169 (11) | |
| D602 | S1B01-04<br>U05G | 8-719-911-55 | GE-511<br>GE-512 | NTE552<br>NTE5806 | ECG552<br>ECG5806 | SK5036/580<br>SK5036/580 | WEP172/506<br>WEP4006/5806 | 103-287<br>212-Z9000 |
| D603 | V19C<br>V19E | 8-719-901-93 | GE-511<br>GE-511 | NTE552<br>NTE552 | ECG552<br>ECG552 | SK9000/552<br>SK9000/552 | WEP172/506<br>WEP172/506 | 103-287<br>103-287 |
| D604 | S1B01-04<br>U05G | 8-719-911-55 | GE-511<br>GE-512 | NTE552<br>NTE5806 | ECG552<br>ECG5806 | SK5036/580<br>SK5036/580 | WEP172/506<br>WEP4006/5806 | 103-287<br>212-Z9000 |
| D605 | S1B01-02<br>V06J | 8-719-901-39 | GE-504A<br>GE-504A | NTE116<br>NTE116 | ECG116<br>ECG116 | SK3311<br>SK3311 | WEP156<br>WEP156 | 212-76-02<br>212-76-02 |
| D606 | RD5.1EN3<br>RD5.1E-N3 | 8-719-102-69 | GEZD-5.1<br>GEZD-5.1 | NTE5010A<br>NTE5010A | ECG5010A<br>ECG5010A | SK5A1/5010A<br>SK5A1/5010A | WEP1411/5010<br>WEP1411/5010 | 103-279-10<br>103-279-10 |
| IC1 | 20106<br>CX20106 | 8-752-010-60 | | | ECG1658 | | | |
| IC102 | LA7910 | 8-759-800-65 | | | | | | |
| IC103 | CX520-108N | 8-759-910-21 | | | | | | |
| IC104 | CX-7958<br>CX7958 | 8-759-909-50 | | | | | | |
| IC105 | uPD6250C<br>UPD6250C | 8-759-102-12 | | | | | | |
| IC201 | 20014A<br>CX20014A | 8-752-001-41 | | | | | | |
| # IC301 | 20082<br>CX20082-0<br>CX20082 | 8-752-008-20 | | | | | | |

## PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

## MISCELLANEOUS

| | ITEM No. | PART NAME | MFGR. PART No. | NOTES |
|---|---|---|---|---|
| | CF201 | Filter | 1-409-332-00 | Ceramic, 4.5MHz Trap |
| | CF202 | Filter | 1-527-943-00 | Ceramic |
| | CP101 | Network | | 5-10K Resistors |
| | CP102 | Network | | 4-220pF Capacitors |
| | CP103 | Network | | 4-22K Resistors |
| # | CR001 | Component Combination | | Antenna Isolation |
| # | CR002 | Component Combination | | Antenna Isolation |
| | D1 | LED | 8-719-110-32 | |
| | D104 | LED | 8-719-901-96 | Sleep Indicator, Red |
| # | HVR | Resistor Assembly | 1-228-482-25 | High Voltage |
| # | L901 | Degaussing Coil | 1-425-901-22 | |
| # | L902 | Degaussing Coil | 1-425-901-22 | |
| | NL501 | Neon Lamp | 1-519-237-11 | |
| # | P600 | Cord | 1-557-269-11 | AC Power |
| # | RY601 | Relay | 1-515-346-12 | Power |
| | S101 | Switch | 1-554-804-11 | Power On/Off |
| | S102 | Switch | 1-554-804-11 | Channel-Up |
| | S103 | Switch | 1-554-804-11 | Channel-Down |
| | S104 | Switch | 1-554-804-11 | Volume-Up |
| | S105 | Switch | 1-554-804-11 | Volume-Down |
| | S106 | Switch | 1-554-804-11 | Picture-Up |
| | S107 | Switch | 1-554-804-11 | Picture-Down |
| | S108 | Switch | 1-554-805-11 | Add |
| | S109 | Switch | 1-554-805-11 | Erase |
| | S110 | Switch | 1-554-806-11 | CATV/Normal |
| | S501 | Switch | 1-554-186-11 | Vert Centering |
| | SG501 | Spark Gap | 1-519-063-XX | |
| | SWF201 | Filter | 1-404-227-71 | SAW (45MHz) |
| # | V901 | CRT | 520XB22 | |
| | X101 | Crystal | 1-567-254-11 | Ceramic, Oscillator-2MHz |
| | X301 | Crystal | 1-527-396-00 | 3.58MHz Oscillator |
| | | Antenna | | UHF RUSSELL Replacement Antenna LIN-2H |
| | | Antenna | 1-501-284-00 | VHF RUSSELL Replacement Assembly POR-SON |
| | | Antenna | | VHF RUSSELL Replacement Rod SIM-18H |
| | | Earphone | 1-504-034-32 | Magnetic (ME-20B) |
| | | Magnet | 1-452-032-00 | Disk 10mm |
| | | Magnet | 1-452-094-00 | Rotatable 15mm |
| | | Magnet | 1-452-146-00 | BMC |
| | | Permalloy Assembly | X-4309-608-0 | Convergence |
| | | P.C. Board | A-1295-829-A | "A" (Main) Board Complete |
| # | | P.C. Board | A-1330-492-A | "C" (CRT) |
| # | | P.C. Board | 1-611-704-11 | "K" Board |
| # | | P.C. Board | 1-611-703-11 | "N" Board |
| # | | Selection Block | 1-417-111-11 | HIT Antenna |
| # | | Sythesizer Unit | 1-463-471-31 | |
| # | | Terminal Board | 1-536-835-11 | Antenna |
| # | | UHF/VHF Tuner | 1-463-470-00 | PTS Part Number 1-463-470-00 |

# For SAFETY use only equivalent replacement part.

## CABINETS & CABINET PARTS (When ordering specify model, chassis & color)

| ITEM | PART No. | PART No. | PART No. | PART No. |
|---|---|---|---|---|
| Models | KV-1970R | KV-1971R | KV-1992R | KV-1993R |
| Cabinet Front Assembly | X-4370-607-1 | X-4370-611-1 | X-4370-607-2 | X-4370-607-3 |
| Cabinet Back Assembly | 4-370-636-00 | 4-370-636-00 | 4-370-636-00 | 4-370-636-00 |
| Bezel Assembly | X-4370-608-1 | X-4370-608-1 | X-4370-608-2 | X-4370-608-3 |
| Pushbutton-Picture + and - | X-4370-603-1 | X-4370-603-1 | X-4370-603-1 | X-4370-603-1 |
| Pushbutton-Volume + and - | X-4370-604-1 | X-4370-604-1 | X-437-604-1 | X-4370-604-1 |
| Pushbutton-Channel + and - | X-4370-605-1 | X-4370-605-1 | X-437-605-1 | X-4370-605-1 |





| | ITEM No. | TYPE No. | MFGR. PART No. | GENERAL ELECTRIC PART No. | NEW-TONE NTE PART No. | REPLACEMENT DATA: PHILIPS ECG PART No. | REPLACEMENT DATA: RCA PART No. | REPLACEMENT DATA: WORKMAN PART No. | REPLACEMENT DATA: ZENITH PART No. |
|---|---|---|---|---|---|---|---|---|---|
| | IC501 | uPC1378H | 8-759-113-78 | | | | SK7653 | | |
| | | UPC1378H-L | | | | | SK7653 | | |
| # | IC601 | STK563F | | | | | SK7703 | | |
| | | STK583FST | | | | | | | |
| | | STK-563F | 8-749-956-30 | | | | SK7703 | WEP910/289 | 921-1114 |
| | | STK-583FST | 8-749-958-30 | | | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | Q101 | 2SC2458GR | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | 2SC2458 | 8-729-245-83 | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | 2SC2785 | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | Q104 | 2SC2458 | 8-729-245-83 | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | | | | | | | | |
| | Q105 | 2SA1175 | 8-729-204-83 | GE-269 | NTE290A | ECG290A | SK3114A/290A | WEP911/290A | 121-Z9003* |
| | | 2SA1048GR | | GE-269 | NTE290A | ECG290A | SK3114A/290A | WEP911/290A | 121-Z9003* |
| | Q106 | 2SC2458GR | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | 2SC2458 | 8-729-245-83 | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | 2SC2785 | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | | | | | | | | |
| | Q107 | 2SA1175 | 8-729-204-83 | GE-269 | NTE290A | ECG290A | SK3114A/290A | WEP911/290A | 121-Z9003* |
| | | 2SA1048GR | | GE-269 | NTE290A | ECG290A | SK3114A/290A | WEP911/290A | 121-Z9003* |
| | Q108 | 2SC2458GR | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | 2SC2458 | 8-729-245-83 | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | 2SC2785 | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | | | | | | | | |
| | Q201 | 2SC2839E | | GE-210 | NTE85 | ECG85 | SK3122 | WEP910/289 | 921-1114 |
| | | 2SC2839 | | GE-210 | NTE85 | ECG85 | SK3122 | WEP910/289 | 921-1114 |
| | | 2SC2839D | 8-729-883-91 | GE-210 | NTE85 | ECG85 | SK3122 | WEP910/289 | 921-1114 |
| | Q203 | 2SC2458GR | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | 2SC2458 | 8-729-245-83 | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | 2SC2785 | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | | | | | | | | |
| | Q301 | 2SA1175 | 8-729-204-83 | GE-269 | NTE290A | ECG290A | SK3114A/290A | WEP911/290A | 121-Z9003* |
| | | 2SA1048GR | | GE-269 | NTE290A | ECG290A | SK3114A/290A | WEP911/290A | 121-Z9003* |
| | Q302,3 | 2SC2458GR | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | 2SC2458 | 8-729-245-83 | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | 2SC2785 | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | | | | | | | | |
| | Q304 | 2SA1175 | 8-729-204-83 | GE-269 | NTE290A | ECG290A | SK3114A/290A | WEP911/290A | 121-Z9003* |
| | | 2SA1048GR | | GE-269 | NTE290A | ECG290A | SK3114A/290A | WEP911/290A | 121-Z9003* |
| | Q305,6 | 2SC2458GR | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | 2SC2458 | 8-729-245-83 | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | | 2SC2785 | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |

## PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

### COILS & TRANSFORMERS (Sweep Circuits)

| | ITEM No. | FUNCTION | REPLACEMENT DATA | | |
|---|---|---|---|---|---|
| | | | MFGR. PART No. | OTHER IDENTIFICATION | |
| # | DY101 | Yoke Horiz 1.57mH 100° Vert 24.0mH | 1-451-182-61 | | |
| # | L503 | Horiz Width | 1-459-527-21 | 527-21 (1) | |
| | T501 | Horiz Driver | 1-437-090-00 | 437-090-21 (1) | |
| # | T502 | Horiz Pincushion | 1-421-394-11 | | |
| # | T503 | Horiz Output | 1-439-334-11 | | |

#. For SAFETY use only equivalent replacement part.
(1) Number on unit.

### TRANSFORMER (Audio Interstage)

| | ITEM No. | RESISTANCE | | REPLACEMENT DATA | | NOTES |
|---|---|---|---|---|---|---|
| | | PRI. | SEC. | MFGR. PART No. | | |
| # | T205 | 42.3 | 31.9 | 1-427-544-11 427-544-11 (1) | | |
| | | TURNS | RATIO | | | |
| | | 1: | 1.15 | | | |

# For SAFETY use only equivalent replacement part.
(1) Number on unit.

### TRANSFORMER (Audio Output)

| | ITEM No. | IMPEDANCE | | REPLACEMENT DATA | | NOTES |
|---|---|---|---|---|---|---|
| | | PRI. | SEC. | MFGR. PART No. | | |
| # | T602 | 95 | .55 | 1-427-530-11 427-530-11 (1) | | |

# For SAFETY use only equivalent replacement part.
(1) Number on unit.

### SPEAKER

| ITEM No. | TYPE | REPLACEMENT DATA | | NOTES |
|---|---|---|---|---|
| | | MFGR. PART No. | QUAM PART No. | |
| SP901 | 3" X 4" PM 8 Ohms | 1-502-882-61 | 35A05Z8 | |

### FUSE DEVICES

| | ITEM NO. | DESCRIPTION | MFGR. PART NO. | | NOTES |
|---|---|---|---|---|---|
| | | | DEVICE | HOLDER | |
| # | F601 | 5A @ 125V Slow-Blow | 1-532-221-11 | 1-533-127-00 (1) | |
| # | F602 | 1.25A @ 125V Fast-Acting | 1-532-570-11 | 1-533-146-00 (1) | |

# For SAFETY use only equivalent replacement part.
(1) 2 clips use.



## PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

### SEMICONDUCTORS (Select replacement transistor for best results)

| ITEM No. | TYPE No. | MFGR. PART No. | REPLACEMENT DATA | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | GENERAL ELECTRIC PART No. | NEW-TONE NTE PART No. | PHILIPS ECG PART No. | RCA PART No. | WORKMAN PART No. | ZENITH PART No. |
| Q307,8 | 2SA1175F | | GE-269 | NTE290A | ECG290A | SK3114A/290A | WEP911/290A | 121-Z9003* |
| | 2SA1175 | | GE-269 | NTE290A | ECG290A | SK3114A/290A | WEP911/290A | 121-Z9003* |
| Q309,10 | 2SA1048GR | 8-729-204-83 | GE-269 | NTE290A | ECG290A | SK3114A/290A | WEP911/290A | 121-Z9003* |
| | 2SC2785E | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | 2SC2785 | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | 2SC2458 | 8-729-245-83 | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| Q501 | 2SC2688KA | | GE-232 | NTE157 | ECG157 | SK3747/157 | WEP61/157 | 121-Z9016 |
| Q502 | 2SC2688 | 8-729-168-82 | GE-232 | NTE157 | ECG157 | SK3747/157 | WEP61/157 | 121-Z9016 |
| | 2SD1555 | | | NTE2302 | ECG2302 | SK9422 | | |
| Q503 | 2SD1555-LB | 8-729-202-58 | | NTE2302 | ECG2302 | SK9422 | | |
| | 2SD774 | 8-729-177-43 | GE-279 | NTE382 | ECG382 | SK3250/315 | WEP922/315 | 921-1114 |
| Q504,5 | 2SC2785 | | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| | 2SC2458 | 8-729-245-83 | GE-210 | NTE85 | ECG85 | SK3124A/289A | WEP910/289 | 921-1114 |
| Q506 | 2SD880Y | | GE-66A | NTE152 | ECG152 | SK3440/291 | WEP745/152 | 121-987-03 |
| | 2SD880 | 8-729-288-02 | GE-66A | NTE152 | ECG152 | SK3440/291 | WEP745/152 | 121-987-03 |
| | | | | NTE382 | ECG382 | SK3250/315 | WEP922/315 | 921-1114 |
| Q507 | 2SD774 | 8-729-177-43 | GE-279 | NTE382 | ECG382 | SK9137/382 | WEP922/315 | 921-1010 |
| | 2SD789 | | GE-279 | NTE315 | ECG315 | SK9352/399 | WEP68/287* | 121-Z9045* |
| Q601 | 2SC2551R | | GE-222* | NTE399 | ECG399 | SK9352/399 | WEP68/287* | 121-Z9045* |
| | 2SC2551 | 8-729-255-12 | GE-222* | NTE399 | ECG399 | SK9352/399 | WEP68/287* | 121-Z9045* |
| Q701 Thru Q703 | 2SC2278 | 8-729-322-78 | GE-27 | NTE171 | ECG171 | SK3201/171 | WEP702/171 | 121-822 |

# For SAFETY use only equivalent replacement part.
* Rotate 180° to conform with original lead configuration.
(11) Mounting technique may vary from original.

### WIRING DATA

| | |
|---|---|
| High Voltage Lead | Use BELDEN No. 8866 (40 KV) |
| Shielded Hook-up Wire | Use BELDEN No. 8401 or 8421 (Single-Conductor) |
| | 8208 (Two-Conductor) |
| | Available in 13 Colors |
| General-use Unshielded Hook-up Wire | Use BELDEN No. 8529 (Solid) Available in 13 Colors |
| | 8522 (Stranded) |
| 75-Ohm Tuner Input Lead | Use BELDEN No. 8241 |
| 300-Ohm Antenna Lead-In | Use BELDEN No. 8275 (Foam Core) or 8285 (Foam Jacketed) |
| Antenna Rotor Cable | Use BELDEN No. 8464 (Flat) or 8484 (Round) 4-Conductor |
| | 8485 (Round) 5-Conductor |
| | 8488 (Round) 8-Conductor |

## PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

### ELECTROLYTIC CAPACITORS Items Not Listed Are Normally Available At Local Distributors.

| ITEM No. | RATING | MFGR. PART No. |
|---|---|---|
| C206 | .47 50V NP | 1-123-021-00 |
| C534 | 560 25V 10% | 1-123-587-00 |

| ITEM No. | RATING | MFGR. PART No. |
|---|---|---|
| C571 | 4.7 16V NP | 1-121-257-00 |

# For SAFETY use only equivalent replacement part.

### CAPACITORS Items Not Listed Are Normally Available At Local Distributors.

| | ITEM No. | RATING | MFGR. PART No. |
|---|---|---|---|
| # | C001 | .001 125VAC | |
| # | C002 | .001 125VAC | |
| # | C003 | .001 125VAC | |
| | C203 | 15 NP0 50V 5% | 1-102-851-00 |
| | C204 | 68 NP0 50V 5% | 1-102-525-00 |
| | C216 | 68 NP0 50V 5% | 1-102-525-00 |
| | C219 | 12 N150 50V 5% | 1-102-637-00 |

| | ITEM No. | RATING | MFGR. PART No. |
|---|---|---|---|
| | C220 | 18 N150 50V 5% | 1-102-640-00 |
| # | C526 | 330 2KV 10% | 1-162-115-11 |
| | C529 | .3 400V 5% | 1-136-052-00 |
| # | C553 | .0103 2KV 3% | 1-136-242-11 |
| # | C601 | .22 125VAC | 1-108-745-52 |
| | CP102 | Cap Network | (1) |

# For SAFETY use only equivalent replacement part.
(1) Contains four 220pF 50V 10%.

### CONTROLS (All wattages 1/2 watt, or less, unless listed)

| ITEM NO. | FUNCTION | RESISTANCE | MFGR. PART NO. | NOTES |
|---|---|---|---|---|
| RV201 | AGC | 10K | 1-228-724-00 | |
| RV301 | Hue | 20K | 1-230-396-11 | |
| RV302 | Color | 20K | 1-230-396-11 | |
| RV303 | Brightness | 20K Detent @ 50% | 1-230-396-11 | |
| RV304 | Sharpness | 20K Detent @ 50% | 1-230-396-11 | |
| RV501 | Vert Height (Size) | 3300 | 1-228-722-00 | |
| RV503 | Horiz Frequency | 100K | 1-228-728-00 | |
| RV504 | Pin Amp | 4700 | 1-228-723-00 | |
| RV505 | Vert Bias | 22K | 1-228-725-00 | |
| RV506 | Vert Frequency | 22K | 1-228-725-00 | |
| RV701 | Blue Background | 3300 | 1-228-722-00 | |
| RV702 | Blue Drive | 220 | 1-228-717-00 | |
| RV703 | Green Background | 3300 | 1-228-722-00 | |
| RV704 | Green Drive | 220 | 1-228-717-00 | |
| RV705 | Red Background | 3300 | 1-228-722-00 | |
| RV706 | Screen | 2.2M | 1-226-063-00 | |
| RV707 | Focus | 2.2M | 1-226-114-00 | |
| RV708 | Sub Brightness | 22K | 1-228-725-00 | |

### RESISTORS (Power and Special)

| | ITEM No. | RATING | REPLACEMENT DATA MFGR. PART No. | NEW-TONE PART No. | WORKMAN PART No. |
|---|---|---|---|---|---|
| | CP101 | Resistor Network | (1) | | |
| | CP103 | Resistor Network | (2) | | |
| # | R001 | 3.3M 10% 1/2W Carbon | | | 22-2180 |
| | R2 | 200K 1% 1/6W Metal Film | 1-215-476-00 | | |
| | R101 | 3.3 5% 1/8W Carbon Film Nonflammable | 1-247-771-00 | | |
| | R106 | 18K 5% 2W Metal Oxide Nonflammable | 1-206-694-00 | 2W318 | 22-4126 |
| | R204 | 33K 1% 1/6W Metal Film | 1-215-457-00 | | |
| | R205 | 33K 1% 1/4W Metal Film | 1-214-765-00 | | |
| | R301 | 47K 1% 1/6W Metal Film | 1-215-461-00 | | |
| | R501 | 330K 1% 1/2W Metal Film | 1-214-925-00 | | |
| # | R513A | 30K 5% 1/4W Carbon Film | | QW330 | |
| # | R514 | 6200 1% 1/6W Metal Film | 1-215-440-31 | | |
| # | R515 | 56 5% 1/6W Carbon Film | 1-247-801-31 | | |



## PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

### RESISTORS (Power and Special) (cont)

| | ITEM No. | RATING | REPLACEMENT DATA MFGR. PART No. | NEW-TONE PART No. | WORKMAN PART No. |
|---|---|---|---|---|---|
| # | R517 | 10K 1% 1/4W Metal Film | 1-214-753-51 | | |
| | R519 | 2400 1% 1/6W Metal Film | 1-215-430-00 | | |
| | R522 | 560 5% 1W Metal Oxide Nonflammable | 1-213-140-00 | 1W156 | 22-3090 |
| | R524 | 3900 5% 1/4W Carbon Film Nonflammable | 1-247-665-00 | QW239 | 22-1110 |
| | R526 | 15K 5% 2W Metal Oxide Nonflammable | 1-206-692-00 | 2W315 | 22-4124 |
| | R531 | 1 5% 1W Metal Oxide Nonflammable | 1-212-360-00 | 1W1D0 | |
| | R532 | 100K 1% 1/2W Metal Film | 1-214-913-00 | | |
| # | R534 | 2400 5% 1/6W Carbon Film | 1-247-840-31 | | |
| # | R535 | 22K 5% 1/4W Carbon Film | 1-246-505-25 | QW322 | 22-1128 |
| # | R538 | 1800 5% 1W Metal Oxide Nonflammable | 1-213-146-61 | 1W218 | 22-3102 |
| | R539 | 3900 5% 2W Metal Oxide Nonflammable | 1-206-678-00 | 2W239 | 22-4110 |
| | R540 | 18 5% 2W Metal Oxide Nonflammable | 1-206-469-00 | 2W018 | 22-4054 |
| | R542 | 68 5% 2W Metal Oxide Nonflammable | 1-206-483-00 | 2W068 | 22-4068 |
| | R543 | 10 1% 1/6W Metal Film | 1-215-373-31 | | |
| | R544 | 3900 5% 2W Metal Oxide Nonflammable | 1-206-678-00 | 2W239 | 22-4110 |
| | R546 | 150 5% 3W Metal Oxide Nonflammable | 1-206-705-00 | | |
| | R547 | 2200 5% 1/4W Carbon Film Nonflammable | 1-247-139-00 | QW222 | 22-1104 |
| | R550 | 1 5% 1W Metal Oxide Nonflammable | 1-212-360-00 | 1W1D0 | |
| | R551 | 12K 1% 1/6W Metal Film | 1-215-447-00 | | |
| | R557 | 3900 5% 1/8W Carbon Film Nonflammable | 1-247-845-00 | | 22-1110 |
| | R559 | 220K 1% 1/6W Metal Film | 1-215-477-00 | | |
| # | R601 | 1M 10% 1/2W Carbon | 1-202-719-51 | HW510 | 22-2168 |
| | R602 | 2.2 5% 10W WW | 1-205-707-11 | 10W2D2 | |
| | R603 | 3300 5% 1/2W Carbon Film Nonflammable | 1-244-885-00 | HW233 | 22-2108 |
| | R604 | 12K 5% 1W Metal Oxide Nonflammable | 1-213-156-00 | 1W312 | 22-3122 |
| # | R605 | 560 5% 1W Metal Oxide Nonflammable | 1-213-140-61 | 1W156 | 22-3090 |
| | R609 | 22 5% 1/8W Carbon Film Nonflammable | 1-246-984-11 | | 22-1056 |
| | R610 | 4700 5% 2W Metal Oxide Nonflammable | 1-206-680-00 | 2W247 | 22-4112 |
| | R611 | 200 5% 20W WW | 1-205-700-00 | | |
| # | R613 | 100 5% 2W Metal Oxide Nonflammable | 1-206-640-61 | 2W110 | 22-4072 |
| | R614 | 4700 5% 20W WW | 1-205-744-11 | | |
| | R615 | 3300 5% 1W Metal Oxide Nonflammable | 1-213-149-00 | 1W233 | 22-3108 |
| | R616 | 2.2 5% 2W Metal Oxide Nonflammable | 1-206-447-61 | 2W2D2 | |
| | R703 | 15K 5% 2W Metal Oxide Nonflammable | 1-206-692-00 | 2W315 | 22-4124 |
| | R706 | 15K 5% 2W Metal Oxide Nonflammable | 1-206-692-00 | 2W315 | 22-4124 |
| | R709 | 15K 5% 2W Metal Oxide Nonflammable | 1-206-692-00 | 2W315 | 22-4124 |
| | R723 | 2.4 5% 2W Metal Oxide Nonflammable | 1-206-448-00 | 2W2D4 | |
| | TH201 | NTC 1296 Cold | 1-800-627-00 | | FR1015 |
| | TH301 | NTC 10K Cold | 1-800-945-00 | | |
| | TH501 | NTC 10K Cold | 1-800-945-00 | | |
| # | THP601 | PTC 5.0 Cold | 1-800-686-31 | | FR605 |

# For SAFETY use only equivalent replacement part.
(1) Contains five 10K 5% 1/6W Resistors.
(2) Contains four 22K 5% 1/4W Resistors.

### COILS (RF-IF)

| | ITEM No. | FUNCTION | MFGR. PART No. |
|---|---|---|---|
| | L102 | Position Inductor | 1-404-538-11 |
| | L103 | Peaking (1mH) | 1-407-717-00 |
| | L107 | RF Choke (470uH) | 1-408-462-11 |
| | L114 | RF Choke (1.2uH) | 1-407-179-00 |
| | L201 | RF Choke (8.2uH) | 1-408-562-00 |
| | L202 | RF Choke (.68uH) | 1-410-007-11 |
| | L203 | Peaking (.22uH) | 1-410-001-11 |
| | L206 | Peaking (18uH) | 1-408-606-00 |
| | L207 | Peaking (2.7uH) | 1-408-596-00 |
| | L301 | Peaking (6.8uH) | 1-408-601-00 |
| | L302 | Peaking (6.8uH) | 1-408-601-00 |
| | L303 | Peaking (6.8uH) | 1-408-601-00 |
| | L304 | Peaking (6.8uH) | 1-408-601-00 |
| | L305 | RF Choke (33uH) | 1-407-163-00 |
| | L501 | RF Choke (18uH) | 1-407-696-11 |
| # | L502 | Horiz Linearity | 1-459-316-11 |

| | ITEM No. | FUNCTION | MFGR. PART No. |
|---|---|---|---|
| | L504 | RF Choke (22uH) | 1-408-938-0 |
| | L505 | RF Choke (100uH) | 1-407-705-00 |
| | L507 | RF Choke (5.6mH) | 1-407-501-00 |
| | L526 | RF Choke | 1-407-365-00 |
| | L527 | RF Choke | 1-407-364-00 |
| # | L601 | RF Choke (3.3uH) | 1-408-225-11 |
| # | L602 | RF Choke (3.3uH) | 1-408-225-11 |
| | L701 | Peaking (82uH) | 1-408-614-00 |
| | L702 | Peaking (82uH) | 1-408-614-00 |
| | L703 | Peaking (82uH) | 1-408-614-00 |
| | L704 | RF Choke (180uH) | 1-408-618-00 |
| | T201 | Video IF | 1-404-541-11 |
| | T202 | Video If | 1-404-467-00 |
| | T203 | AFT | 1-404-467-00 |
| | T204 | Sound IF | 1-404-505-00 |
| | T601 | Line Filter | 1-421-357-31 |

# For SAFETY use only equivalent replacement part.